

حمل الآن

مجاناً وحصرياً

المراجعة رقم (1)

اختبار شهر مارس





Test

1

1 Choose the correct answer from those given :

(1) If $A = \begin{pmatrix} 4\ell & -1 \\ 2m & 2 \end{pmatrix}$, $B = \begin{pmatrix} n & m+1 \\ \ell & 2 \end{pmatrix}$ and $A = B^t$, then $\ell + m + n = \dots\dots\dots$

- (a) -5 (b) 6 (c) -4 (d) 2

(2) Each of the following equals $(1 - \sin \theta) \left(1 + \frac{1}{\csc \theta}\right)$ except $\dots\dots\dots$

- (a) $\frac{1}{1 + \tan^2 \theta}$ (b) $\cos^2 \theta$ (c) $1 - \sin^2 \theta$ (d) $\sec \theta \cot \theta$

(3) If $\begin{vmatrix} 2-X & 2 \\ -3 & X+2 \end{vmatrix} = 1$, then : $X = \dots\dots\dots$

- (a) -3 (b) ± 3 (c) 3 (d) ± 4

(4) If $\vec{A} = (7, 8)$, $\vec{B} = (4, 4)$, then all the following statements are true except $\dots\dots\dots$

- (a) $\vec{A} + \vec{B} = (11, 12)$ (b) $\vec{A} - \vec{B} = (3, 4)$
(c) $2\vec{A} - \vec{B} = (10, 12)$ (d) $\vec{AB} + \vec{A} = (4, 6)$

(5) If A and B are two matrices where $AB^t + BA^t = O$, then AB^t is a $\dots\dots\dots$ matrix.

- (a) zero (b) symmetric (c) skew symmetric (d) diagonal

(6) Which of the following vectors represents the velocity vector of a car moving with speed 100 km./hr. in direction of 60° north of west ?

- (a) $-50\vec{i} + 50\sqrt{3}\vec{j}$ (b) $50\sqrt{3}\vec{i} - 50\vec{j}$
(c) $-50\sqrt{3}\vec{i} + 50\vec{j}$ (d) $-50\vec{i} - 50\sqrt{3}\vec{j}$

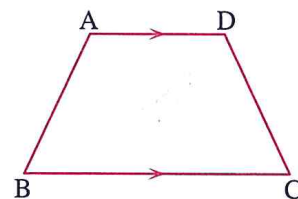
(7) If $\vec{A} = \left(10, \frac{\pi}{4}\right)$, then the polar form of $\frac{1}{2}\vec{A}$ is $\dots\dots\dots$

- (a) $\left(5, \frac{\pi}{2}\right)$ (b) $\left(10, \frac{\pi}{8}\right)$ (c) $\left(10, \frac{\pi}{2}\right)$ (d) $\left(5, \frac{\pi}{4}\right)$

(8) In the opposite figure :

ABCD is a trapezium in which $BC = 2AD$, $\vec{AD} \parallel \vec{BC}$, then $\vec{BC} + 2\vec{DC} = \dots\dots\dots$

- (a) $\vec{AC}$ (b) $\vec{BA} + \vec{AD}$
(c) $\vec{BD}$ (d) $2\vec{AC}$



(9) $\begin{pmatrix} 2 & 4 \\ -1 & 3 \end{pmatrix} \times \begin{pmatrix} 0.3 & -0.4 \\ 0.1 & 0.2 \end{pmatrix} = \dots\dots\dots$

- (a) $\begin{pmatrix} 4 & 0 \\ 0 & 4 \end{pmatrix}$ (b) $\begin{pmatrix} -3 \\ 5 \end{pmatrix}$ (c) $\frac{1}{5} \begin{pmatrix} 7 & 4 \end{pmatrix}$ (d) I

(10) If $\vec{A} \parallel \vec{B}$ and $\vec{A} = (2, 3)$, $\|\vec{B}\| = 4\sqrt{13}$, then $\vec{B} = \dots\dots\dots$

- (a) $\pm \vec{A}$ (b) $\pm 2 \vec{A}$
(c) $\pm 4 \vec{A}$ (d) $(8\sqrt{13}, 12\sqrt{13})$

(11) The S.S. of the equation : $\sin^2 \theta - \cos \theta = \frac{1}{4}$ where $0 \leq \theta \leq 2\pi$ is $\dots\dots\dots$

- (a) $\left\{ \frac{2\pi}{3}, \frac{\pi}{3} \right\}$ (b) $\left\{ \frac{\pi}{3}, \frac{5\pi}{3} \right\}$ (c) $\left\{ \frac{-\pi}{3}, \frac{2\pi}{3} \right\}$ (d) $\left\{ \frac{2\pi}{3}, \frac{5\pi}{3} \right\}$

(12) If $3\vec{i} + 4\vec{j} = (k, \theta^{\text{rad}})$, $\vec{A} = \left(k, \frac{\pi}{2} + \theta^{\text{rad}}\right)$, then $\vec{A} = \dots\dots\dots$

- (a) $-4\vec{i} + 3\vec{j}$ (b) $3\vec{i} - 4\vec{j}$ (c) $-3\vec{i} + 4\vec{j}$ (d) $4\vec{i} - 3\vec{j}$

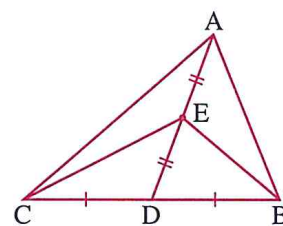
2 Answer the following two questions :

(1) In the opposite figure :

D is the midpoint of $\overline{BC}$

, E is the midpoint of $\overline{AD}$

Prove that : $\vec{AB} + \vec{AC} = 2\vec{EB} + 2\vec{EC}$



(2) Without expanding the brackets, find the value of $\begin{vmatrix} 5 & -1 & 10 \\ 4 & 2 & 8 \\ -5 & 2 & -10 \end{vmatrix}$

Test 2

1 Choose the correct answer from those given :

(1) $\sin^2 \theta + \sin^2 \theta \tan^2 \theta = \dots\dots\dots$

- (a) $2 \sin^2 \theta \tan^2 \theta$ (b) $2 \sin^2 \theta \cot^2 \theta$ (c) $\sin^2 \theta$ (d) $\tan^2 \theta$

(2) If $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$, $B = \begin{pmatrix} 4 & -2 \\ -3 & 1 \end{pmatrix}$, then $AB + BA = \dots\dots\dots$

- (a) O (b) $-4I$ (c) $4I$ (d) $-2I$

(3) If $\begin{vmatrix} a & b & c \\ d & e & f \\ x & y & z \end{vmatrix} = 15$, then $\begin{vmatrix} a & b & c \\ x & y & z \\ d & e & f \end{vmatrix} = \dots\dots\dots$

- (a) -30 (b) 15 (c) zero (d) -15

(4) If $\vec{A} = (k, 2)$, $\vec{B} = (-2, 2)$, $\vec{C} = (0, 4)$ and $\vec{A} \parallel \vec{CB}$, then $k = \dots\dots\dots$

- (a) 3 (b) -6 (c) 1 (d) 2

(5) If $\vec{XY} = (2, 3)$, $\vec{YZ} = (4, 5)$, then $\vec{XZ} = \dots\dots\dots$

- (a) (6, 8) (b) (2, 2) (c) (8, 8) (d) (4, 3)

(6) The general solution of the equation : $\tan \theta + 1 = 0$ is $\dots\dots\dots$ (where $n \in \mathbb{Z}$)

- (a) $\theta = \frac{3}{4} \pi + n \pi$ (b) $\theta = \frac{7}{4} \pi + 2 n \pi$
(c) $\theta = \frac{\pi}{4} + n \pi$ (d) $\theta = \frac{\pi}{2} + 2 n \pi$

(7) If the matrix A is of order 2×2 where $A = (a_{ij})$, $a_{ij} = i + j$, then $A^t = \dots\dots\dots$

- (a) A (b) 2 A (c) -A (d) -2 A

(8) If A (-3, -7), B (4, 0), then the point C which divides $\vec{AB}$ internally in the ratio 5 : 2 is $\dots\dots\dots$

- (a) (-2, 2) (b) (2, 2) (c) (2, -2) (d) (-2, -2)

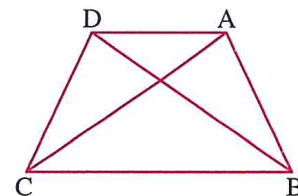
(9) The sum of roots of the equation $\left| \begin{matrix} x & -1 \\ 2 & x \end{matrix} \right| + \left| \begin{matrix} 1 & 3 \\ 2 & x \end{matrix} \right| = 2$ equals $\dots\dots\dots$

- (a) -2 (b) -1 (c) 0 (d) 1

(10) In the opposite figure :

ABCD is quadrilateral, then $\vec{AC} + \vec{BD} = \dots\dots\dots$

- (a) $\vec{AB} + \vec{CD}$ (b) $\vec{BA} + \vec{DC}$
(c) $\vec{DA} + \vec{CB}$ (d) $\vec{AD} + \vec{BC}$



(11) The equation of the straight line that makes an angle of measure 45° with the positive direction of the X-axis and intercepts 5 units of positive part of the y-axis is $\dots\dots\dots$

- (a) $y = x - 5$ (b) $y = x + 5$ (c) $y = \frac{1}{\sqrt{2}} x + 5$ (d) $y = \frac{1}{2} x + 5$

(12) If $\vec{A} = 4\vec{i} - 3\vec{j}$, $\vec{B}$ is a vector where $\vec{A} \perp \vec{B}$, $\|\vec{A}\| = \|\vec{B}\|$, then $\vec{B}$ can be equal to $\dots\dots\dots$

- (a) $3\vec{i} + 4\vec{j}$ (b) $-3\vec{i} + 4\vec{j}$ (c) $4\vec{i} + 3\vec{j}$ (d) $-4\vec{i} + 3\vec{j}$

2 Answer the following two questions :

(1) If $\vec{A} = (-1, 2)$, $\vec{B} = (3, 7)$, $\vec{C} = (7, 12)$, find $\vec{C}$ in terms of $\vec{A}$ and $\vec{B}$

(2) If $A = \begin{pmatrix} 2 & -1 \\ -3 & 5 \end{pmatrix}$, $B = \begin{pmatrix} -1 & 4 \\ 6 & -2 \end{pmatrix}$, $C = \begin{pmatrix} 1 & -3 \\ 0 & 3 \end{pmatrix}$

Find the matrix : $2A - 3B + 4C$

كيفية طباعة صفحات معينة من ملف معين مثلا ازاي نطبع الصفحات من صفحة 4 الى صفحة 9



حمل الآن

مجاناً وحصرياً

المراجعة رقم (2)

اختبار شهر مارس



Super Math

March Revision Sec 1

Algebra Lessons

Lesson 1
Lesson 2
Lesson 3

Geometry Lessons

Lesson 1
Lesson 2

Trigonometry

Lesson 1
Lesson 2

Remember

- 1) A is called a symmetric matrix If $A = A^t$
- 2) A is called a skew symmetric matrix If $A = -A^t$, $A + A^t = 0$
- 3) $(AB)^t = B^t A^t$

Vectors Rules

- 1) $\overrightarrow{AB} + \overrightarrow{BA} = 0$
- 2) $\overrightarrow{AB} = -\overrightarrow{BA}$
- 3) $\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$
- 4) $\overrightarrow{AC} - \overrightarrow{AB} = \overrightarrow{BC}$, $\overrightarrow{AC} - \overrightarrow{BC} = \overrightarrow{AB}$
- 5) $\overrightarrow{AB} = \overrightarrow{B} - \overrightarrow{A}$
- 6) If M is midpoint of $\overline{XY}$ then
 - a. $\overrightarrow{XM} = \overrightarrow{MY}$

 - b. $\overrightarrow{XM} + \overrightarrow{MY} = \overrightarrow{XY}$
 - c. $\overrightarrow{XM} = -\overrightarrow{MX}$
 - d. $\overrightarrow{XM} + \overrightarrow{MX} = \vec{0}$

$$\sec \theta = \frac{1}{\cos \theta}$$

$$\csc \theta = \frac{1}{\sin \theta}$$

$$\tan \theta = \frac{\sin \theta}{\cos \theta}$$

$$\cot \theta = \frac{\cos \theta}{\sin \theta}$$

$$\sin^2 \theta + \cos^2 \theta = 1$$

$$\sin^2 \theta = 1 - \cos^2 \theta$$

$$\cos^2 \theta = 1 - \sin^2 \theta$$

$$2 \sin^2 \theta + 2 \cos^2 \theta = 2$$

$$3 \sin^2 30 + 3 \cos^2 30 = 3$$

$$1 + \tan^2 \theta = \sec^2 \theta$$

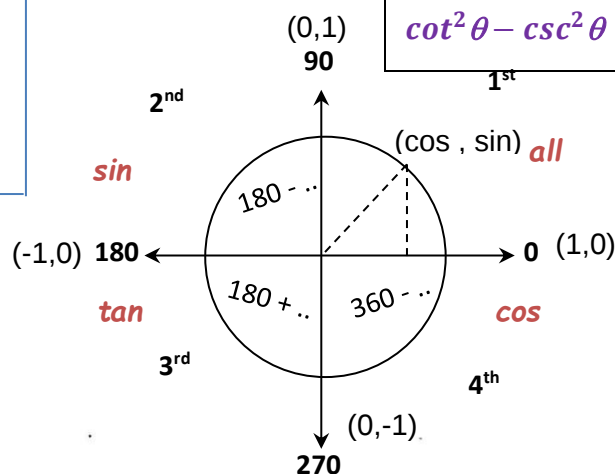
$$\sec^2 \theta - \tan^2 \theta = 1$$

$$\tan^2 \theta - \sec^2 \theta = -1$$

$$1 + \cot^2 \theta = \csc^2 \theta$$

$$\csc^2 \theta - \cot^2 \theta = 1$$

$$\cot^2 \theta - \csc^2 \theta = -1$$



Choose

- 1) If $(x^t)^t - X = \dots\dots\dots$
 (a) 0 (b) X (c) $2X$ (d) zero
- 2) If $X + \begin{pmatrix} 3 & -2 \\ 5 & 0 \end{pmatrix} = 0$, then $X = \dots\dots\dots$
 (a) $\begin{pmatrix} -3 & 2 \\ -5 & 0 \end{pmatrix}$ (b) $\begin{pmatrix} 3 & 5 \\ -2 & 0 \end{pmatrix}$ (c) $\begin{pmatrix} 0 & 2 \\ -5 & 3 \end{pmatrix}$ (d) $\begin{pmatrix} -3 & -2 \\ -5 & 0 \end{pmatrix}$
- 3) The matrix $\begin{pmatrix} 3 & 2 & 1 \end{pmatrix}$ is of order.....
 (a) 2×1 (b) 3×2 (c) 1×3 (d) 3×1
- 4) If the matrix $A = \begin{pmatrix} 4 & m & 2 \\ y-x & 5 & 7 \\ y & x-1 & 1 \end{pmatrix}$ is symmetric, then $m = \dots\dots\dots$
 (a) 4 (b) -6 (c) 10 (d) -8
- 5) If A is a matrix of order 4×7 , B is a matrix of order 7×3 , then the order of $(AB)^t$ is.....
 (a) 7×7 (b) 4×3 (c) 4×7 (d) 3×4
- 6) If $A = \begin{pmatrix} 3 & 1 \\ -2 & 5 \end{pmatrix}$, $C = \begin{pmatrix} 4 & 7 \\ 8 & 9 \end{pmatrix}$, then $a_{21} + c_{12} = \dots\dots\dots$
 (a) 5 (b) 4 (c) -5 (d) 3
- 7) If $\begin{pmatrix} a & b & c \\ d & e & f \\ x & y & z \end{pmatrix}$ is a skew symmetric, then $\frac{a+b+c+f}{d+x+y+z} = \dots\dots\dots$
 (a) 1 (b) zero (c) -1 (d) e
- 8) If A is a matrix in order 2×3 , B^t is a matrix in the order 1×3 , then AB in the order.....
 (a) 3×3 (b) 3×1 (c) 2×1 (d) 1×2
- 9) If $\begin{pmatrix} 3 & a-2 \\ b & 5 \end{pmatrix} = \begin{pmatrix} 3 & 4 \\ 7 & 5 \end{pmatrix}^t$, then $(a, b) = \dots\dots\dots$
 (a) (6, 7) (b) (7, 6) (c) (9, 4) (d) (4, 7)

- 10) If A, B are two matrices where $AB = \begin{pmatrix} 3 & -1 \\ 4 & 5 \end{pmatrix}$, then $B^t A^t = \dots\dots\dots$
- (a) $\begin{pmatrix} 3 & -1 \\ 4 & 5 \end{pmatrix}$ (b) $\begin{pmatrix} 3 & 4 \\ -1 & 5 \end{pmatrix}$ (c) $\begin{pmatrix} 5 & -1 \\ 4 & 3 \end{pmatrix}$ (d) $\begin{pmatrix} 5 & 4 \\ -1 & 3 \end{pmatrix}$
- 11) If $A = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$ and $B = (2 \ 5)$, then $(BA)^t = \dots\dots\dots$
- (a) $\begin{pmatrix} 6 & 15 \\ -4 & -10 \end{pmatrix}$ (b) $\begin{pmatrix} 6 & -4 \\ 15 & -10 \end{pmatrix}$ (c) (-4) (d) (4)
- 12) If $A = (2 \ 3)$, $B = \begin{pmatrix} x & 0 \\ 1 & y \end{pmatrix}$, $A \times B = (9 \ 6)$, then $x + y = \dots\dots\dots$
- (a) 3 (b) 5 (c) 7 (d) 9
- 13) If $\begin{pmatrix} 4 & 1 \\ 3 & 1 \end{pmatrix} \begin{pmatrix} 1 & -1 \\ -3 & x \end{pmatrix} = I$, then $x = \dots\dots\dots$
- a) 1 b) 2 c) 3 d) 4
- 14) If $\begin{pmatrix} 3 & 2 & x \\ 4 & 5 & 1 \end{pmatrix} \begin{pmatrix} 2 & -1 \\ 1 & 0 \\ y & 2 \end{pmatrix} = \begin{pmatrix} 14 & -1 \\ 19 & -2 \end{pmatrix}$, then $x - y = \dots\dots\dots$
- a) 3 b) -3 c) 5 d) -5
- 15) If $X = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$, $Y = (-3 \ 5)$, then $Y X = \dots\dots\dots$
- a) $\begin{pmatrix} -9 \\ 10 \end{pmatrix}$ b) $(-9 \ 10)$ c) $\begin{pmatrix} -9 & 15 \\ 6 & 10 \end{pmatrix}$ d) (1)
- 16) A car moved 20 meters in direction of North, then moved the same distance in the direction of West, then the displacement of the car is $\dots\dots\dots$
- (a) 40 m in the West direction (b) 40 m in the Western North direction
(c) $20\sqrt{2}$ m in the Western North direction (d) $20\sqrt{2}$ m in the Western South direction
- 17) All the following vectors are unit vectors except $\dots\dots\dots$
- (a) $(1, 0)$ (b) $(0, -1)$ (c) $(0.6, 0.8)$ (d) $(1, 1)$
- 18) If $k \|4 \vec{A}\| = \|-3 \vec{A}\|$, then $k = \dots\dots\dots$
- (a) $\frac{3}{4}$ (b) $\frac{4}{3}$ (c) 1 (d) 12

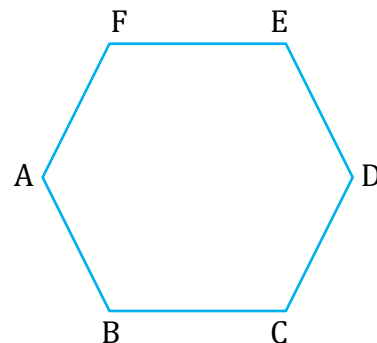
- 19) If $\vec{X} = \vec{0}$, $\vec{X} = (a - 3, b + 5)$, then $a + b = \dots\dots\dots$
 (a) -2 (b) 2 (c) 8 (d) 15
- 20) The polar form of the vector $\vec{r} = (3, \sqrt{3})$ is $\dots\dots\dots$
 (a) $(2\sqrt{3}, \frac{\pi}{6})$ (b) $(2\sqrt{3}, \frac{\pi}{3})$ (c) $(\sqrt{3}, \frac{\pi}{6})$ (d) $(\sqrt{3}, \frac{\pi}{3})$
- 21) In the Cartesian coordinates plane, if $\vec{OA} = (6, 6\sqrt{3})$, then its polar form is $\dots\dots\dots$
 (a) $(12, \frac{\pi}{3})$ (b) $(12, \frac{\pi}{6})$ (c) $(6, \frac{\pi}{3})$ (d) $(6, \frac{\pi}{6})$
- 22) If $\vec{A} = (3, 4)$, $\vec{B} = (k, -8)$ and $\vec{A} \parallel \vec{B}$, then $k = \dots\dots\dots$
 (a) -6 (b) 3 (c) 4 (d) 6
- 23) $\vec{AB} - \vec{BA} = \dots\dots\dots$
 (a) zero (b) $2\vec{AB}$ (c) $2\vec{BA}$ (d) $\vec{0}$
- 24) If $\vec{C} = (5, 1)$, $\vec{D} = (-2, 4)$, then $\|\vec{C} + \frac{1}{2}\vec{D}\| = \dots\dots\dots$
 (a) 25 (b) 7 (c) 5 (d) 1

25) In the opposite figure:

ABCDEF is a regular hexagon, then

$$(\vec{AB} - \vec{CB}) + \vec{AF} + \vec{DE} = \dots\dots\dots$$

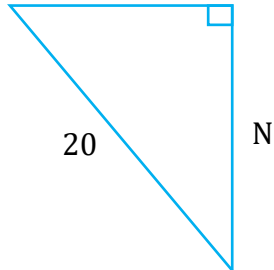
- (a) $\vec{FE}$ (b) $\vec{AE}$
 (c) $\vec{AD}$ (d) $\vec{AC}$

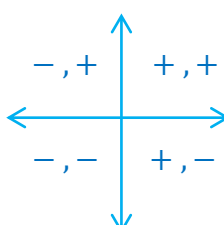
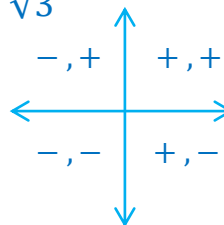


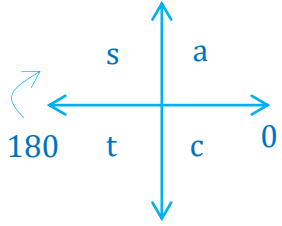
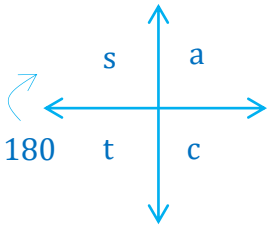
- 26) If $A = (3, -5)$, $B = (-1, 5)$, $\vec{M} = (6, k)$, $\vec{AB} \parallel \vec{M}$, then $k = \dots\dots\dots$
 (a) -15 (b) -10 (c) -5 (d) 5
- 27) If $(6, 4)$ and $(3, m)$ are two perpendicular vectors, then $m = \dots\dots\dots$
 (a) $-\frac{9}{2}$ (b) 3 (c) 6 (d) 10
- 28) If $\|k(3, 4)\| = 1$, then $k = \dots\dots\dots$
 (a) $\frac{1}{7}$ (b) $\frac{1}{25}$ (c) $\pm \frac{1}{5}$ (d) ± 5

- 29) If $2(3, y) + 3(x, -2) = (3, 2)$, then : $x + y = \dots\dots\dots$
- (a) 3 (b) 4 (c) 5 (d) 6
- 30) If $\vec{A} = (x_1, y_1)$ and $\vec{B} = (x_2, y_2)$, then the two vectors $\vec{A}$ and $\vec{B}$ are perpendicular if ..
- (a) $x_1 y_2 - x_2 y_1 = 0$ (b) $x_1 x_2 - y_1 y_2 = 0$
 (c) $\frac{x_1 x_2}{y_1 y_2} = -1$ (d) $\frac{x_1 y_2}{x_2 y_1} = 1$
- 31) If $\vec{A} = (4, 5)$ and $\vec{B} = (-20, 16)$, then the two vectors $\vec{A}$ and $\vec{B}$ are
- (a) perpendicular. (b) parallel
 (c) equivalent (d) otherwise
- 32) If $\vec{B} = (-2, 4)$, $\vec{C} = (4, 3)$ and $2\vec{A} - 3\vec{B} = 4\vec{C}$, then $\|\vec{A}\| = \dots\dots\dots$
- (a) 5 (b) 12 (c) 13 (d) 7
- 33) If $\vec{AB} = (3, -4)$, $\vec{BC} = (2, 1)$, then $\vec{CA} = \dots\dots\dots$
- (a) $(1, -5)$ (b) $(-3, 5)$ (c) $(3, -4)$ (d) $(-5, 3)$
- 34) The general solution of the equation $\tan \theta = \sqrt{3}$ where $n \in \mathbb{Z}$
- (a) $\frac{\pi}{2} + n\pi$ (b) $\frac{\pi}{3} + 2n\pi$ (c) $\frac{\pi}{6} + n\pi$ (d) $\frac{\pi}{3} + n\pi$
- 35) The value of the expression: $5 \cos \theta \times 3 \sec \theta = \dots\dots\dots$
- (a) 1 (b) 2 (c) 8 (d) 15
- 36) The simplest form of the expression: $\sin(180^\circ - \theta) \times \sec(90^\circ - \theta)$ is.....
- (a) 90° (b) $\tan \theta$ (c) $\cos \theta$ (d) 1
- 37) The value of θ which satisfies the equation $\sqrt{3} \cos \theta = \sin \theta$ where $\theta \in [0, \pi]$
- (a) 30° (b) 60° (c) 120° (d) 150°
- 38) The simplest form of the expression: $\frac{\cot^2 \theta - \csc^2 \theta}{\cot \theta}$ is.....
- (a) -1 (b) $\cot \theta - \csc^2 \theta$ (c) $-\cot \theta$ (d) $-\tan \theta$

- 39) The number of solutions of the equation: $\cos^2 \theta - 4 \cos \theta + 4 = 0$ is.....
 (a) 0 (b) 1 (c) 2 (d) 3
- 40) Find the general solution for the equation: $\frac{\tan 5x}{\tan(90^\circ + 4x)} = -1$
- 41) $\sin^2 x + \cos^2 x + \cot^2 x = \dots\dots\dots$
 (a) 1 (b) $\cot^2 x$ (c) $\csc^2 x$ (d) $\sec^2 x$
- 42) If $\tan \theta = 3$, then $\sec^2 \theta = \dots\dots\dots$
 (a) 9 (b) 10 (c) $\frac{1}{10}$ (d) $\frac{9}{10}$
- 43) $\frac{\sin \theta}{\csc \theta} + \frac{\cos \theta}{\sec \theta} = \dots\dots\dots$
 (a) $\tan \theta$ (b) $\sin \theta + \cos \theta$ (c) $\sec \theta \csc \theta$ (d) 1
- 44) The general solution of the equation: $\cos \theta = -1$ is.....where $n \in \mathbb{Z}$
 (a) $\frac{\pi}{2} + n\pi$ (b) $\frac{\pi}{3} + n\pi$ (c) $\pi + 2n\pi$ (d) $\frac{\pi}{6} + 2n\pi$
- 45) If $3^{\sin \theta} = 1$, where $\theta \in]0, 2\pi[$, then $\theta = \dots\dots\dots^\circ$
 (a) 45 (b) 90 (c) 180 (d) 270

Model answers	
Choose	$a - 2 = 7$ $a = 9 \quad b = 4$
1. d $X - X = 0$	10.b $(AB)^t = B^t A^t = \begin{pmatrix} 3 & -1 \\ 4 & 5 \end{pmatrix}$
2. a $X = \begin{pmatrix} -3 & 2 \\ -5 & 0 \end{pmatrix}$	11.c $(2 \quad 5) \begin{pmatrix} 3 \\ -2 \end{pmatrix} = (-4)$
3. c 1×3	12.b $\begin{array}{l l} 2x + 3 = 9 & 2 \times 0 + 3y = 6 \\ 2x = 6 & 3y = 6 \\ x = 3 & y = 2 \end{array}$ $x + y = 3 + 2 = 5$
4. b $y = 2$ $x - 1 = 7$ $x = 7 + 1 = 8$ $m = y - x$ $m = 2 - 8 = -6$	13.d $\begin{array}{l} 4 \times (-1) + x = 0 \\ -4 + x = 0 \\ x = 4 \end{array}$
5. d $\begin{array}{ccc} A & B & = AB \\ 4 \times 7 & 7 \times 3 & 4 \times 3 \end{array}$	14.d $\begin{array}{l l} -3 + 2x = -1 & 8 + 5 + y = 19 \\ 2x = 2 & 13 + y = 19 \\ x = 1 & y = 6 \end{array}$ $x - y = 1 - 6 = -5$
6. a $\begin{array}{l} a_{21} + c_{12} \\ = -2 + 7 = 5 \end{array}$	15.d $(-3 \quad 5) \begin{pmatrix} 3 \\ 2 \end{pmatrix} = (1)$
7. c $\begin{array}{l} a = e = z = 0 \\ \frac{a+b+c+f}{d+x+y+z} \\ = \frac{b+c+f}{d+x+y} = \frac{b+c+f}{-b-c-f} \\ = \frac{b+c+f}{-(b+c+f)} = -1 \end{array}$	16.c $\sqrt{(20)^2 + (20)^2} = 20\sqrt{2}$ 
8. c $\begin{array}{ccc} A_{2 \times 3} & B_{3 \times 1} & \\ AB_{2 \times 1} & & \end{array}$	17.d $\begin{array}{l} -(1, 0), \sqrt{(1)^2 + (0)^2} = 1 \\ -(0, -1), \sqrt{(0)^2 + (-1)^2} = 1 \\ -(0.6, 0.8), \sqrt{(0.6)^2 + (0.8)^2} = 1 \end{array}$
9. c $\begin{pmatrix} 3 & a-2 \\ b & 5 \end{pmatrix} = \begin{pmatrix} 3 & 7 \\ 4 & 5 \end{pmatrix}$	

$-(1, 1), \sqrt{(1)^2 + (1)^2} = \sqrt{2} \neq 1$	$k = \frac{24}{-4} = -6$				
18.a $k 4 \ \vec{A}\ = -3 \ \vec{A}\ $	23.b $\vec{AB} + \vec{AB} = 2 \vec{AB}$				
$4k = 3$ $k = \frac{3}{4}$	24.c $\vec{C} + \frac{1}{2} \vec{D}$ $(5, 1) + (-1, 2)$ $= (4, 3)$ $\ (4, 3)\ = \sqrt{(4)^2 + (3)^2} = 5$				
19.a $(a - 3, b + 5) = (0, 0)$	25.b $\vec{AB} + \vec{BC} + \vec{AF} + \vec{DE}$ $= \vec{BC} + \vec{AF} = \vec{AF} + \vec{FE} = \vec{AE}$				
$a - 3 = 0$ $a = 3$ $b + 5 = 0$ $b = -5$ $a + b$ $3 + (-5) = -2$	26.a $\vec{AB} = \vec{B} - \vec{A} = (-1, 5) - (3, -5)$ $= (-4, 10)$ $\vec{AB} // \vec{M}$ $(-4, 10), (6, k)$				
20.a $\ \vec{r}\ = \sqrt{(3)^2 + (\sqrt{3})^2} = 2\sqrt{3}$ $\tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{\sqrt{3}}{3}$ $\theta = \tan^{-1}\left(\frac{\sqrt{3}}{3}\right) = 30^\circ$ $(2\sqrt{3}, 30^\circ)$ $30 \div 180 = \frac{\pi}{6}$ 	27.a $6 \times 3 + 4m = 0$ $18 + 4m = 0$ $4m = -18$ $m = \frac{-18}{4} = \frac{-9}{2}$				
21.a $\ \vec{OA}\ = \sqrt{(6)^2 + (6\sqrt{3})^2} = 12$ $\tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{6\sqrt{3}}{6} = \sqrt{3}$ $\theta = \tan^{-1}(\sqrt{3}) = 60^\circ$ $(12, 60^\circ)$ $60 \div 180 = \frac{\pi}{3}$ 	28.c $ K \ (3, 4)\ = 1$ $ K \sqrt{3^2 + 4^2} = 1$ $5 K = 1$ $ K = \frac{1}{5}$ $k = \pm \frac{1}{5}$				
22.a $x \times y_2 - x \times y_1 = 0$ $3 \times (-8) - 4 \times k = 0$ $-24 - 4k = 0$ $-4k = 24$	29.a $(6, 2y) + (3x, -6) = (3, 2)$ $(6 + 3x, 2y - 6) = (3, 2)$ <table> <tr> <td>$6 + 3x = 3$</td> <td>$2y - 6 = 2$</td> </tr> <tr> <td>$3x = -3$</td> <td>$2y = 8$</td> </tr> </table>	$6 + 3x = 3$	$2y - 6 = 2$	$3x = -3$	$2y = 8$
$6 + 3x = 3$	$2y - 6 = 2$				
$3x = -3$	$2y = 8$				

$x = -1$ $y = 4$ $x + y = -1 + 4 = 3$	37.b $\sin \theta = \sqrt{3} \cos \theta$ $\frac{\sin \theta}{\cos \theta} = \sqrt{3}$ $\tan \theta = \sqrt{3}$ $\theta = \tan^{-1}(\sqrt{3}) = 60^\circ$ 
30.c $x_1 x_2 + y_1 y_2 = 0$ $x_1 x_2 = -y_1 y_2$ $\frac{x_1 x_2}{y_1 y_2} = -1$	
31.a $4 \times (-20) + 5 \times 16 = 0$ $x_1 x_2 + y_1 y_2 = 0$ perpendicular	38. d $1 + \cot^2 \theta = \csc^2 \theta$ $\csc^2 \theta - \cot^2 \theta = 1$ $\cot^2 \theta - \csc^2 \theta = -1$ $\frac{\cot^2 \theta - \csc^2 \theta}{\cot \theta} = \frac{-1}{\cot \theta} = -\tan \theta$
32.c $2 \vec{A} = 3 \vec{B} + 4 \vec{C}$ $= 3(-2, 4) + 4(4, 3)$ $= (-6, 12) + (16, 12)$ $= (10, 24)$ $\vec{A} = (5, 12)$ $\ \vec{A}\ = \sqrt{5^2 + 12^2} = 13$	39.a let $x = \cos \theta$ $1x^2 - 4x + 4 = 0$ $(x - 2)(x - 2) = 0$ $x - 2 = 0$ $x = 2$ $\cos \theta = 2$ refused $S.S = \emptyset$
33.d $\vec{B} - \vec{A} = (3, -4)$ $\vec{C} - \vec{B} = (2, 1)$ by adding $\vec{C} - \vec{A} = \vec{AC}$ $\vec{AC} = (5, -3)$ $\vec{CA} = (-5, 3)$	40. $\frac{\tan 5x}{-\cot 4x} = -1$ $\tan 5x = \cot 4x$ $\therefore 5x + 4x = 90$ $9x = 90$ $x = 10$ $10 + \pi n$
34.d $\tan \theta = \sqrt{3}$ $\theta = \tan^{-1}(\sqrt{3}) = \frac{60^\circ}{180^\circ} = \frac{\pi}{3} + n\pi$	
35.d $5 \cos \theta \times 3 \times \frac{1}{\cos \theta} = 15$	41.c $\sin^2 x + \cos^2 x + \cot^2 x$ $= 1 + \cot^2 x$ $= \csc^2 x$
36.d $\sin \theta \times \csc \theta$ $\sin \theta \times \frac{1}{\sin \theta} = 1$ 	42.b $\sec^2 \theta = 1 + \tan^2 \theta$ $= 1 + (3)^2$

$$= 1 + 9 = 10$$

43.d

$$\frac{\sin \theta}{\csc \theta} + \frac{\cos \theta}{\sec \theta}$$

$$= \sin \theta \div \csc \theta + \cos \theta \div \sec \theta$$

$$= \sin \theta \div \frac{1}{\sin \theta} + \cos \theta \div \frac{1}{\cos \theta}$$

$$= \sin \theta \times \sin \theta + \cos \theta \times \cos \theta$$

$$= \sin^2 \theta + \cos^2 \theta = 1$$

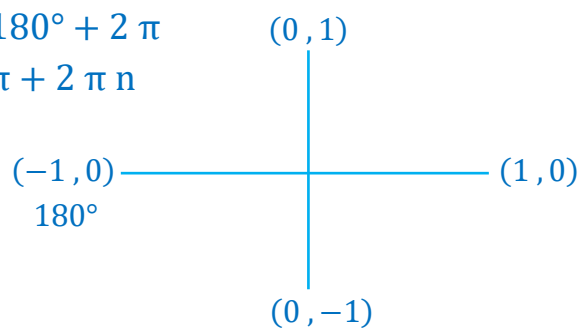
44.d

$$\cos \theta = -1$$

$$\theta = 180^\circ$$

$$180^\circ + 2\pi$$

$$\pi + 2\pi n$$

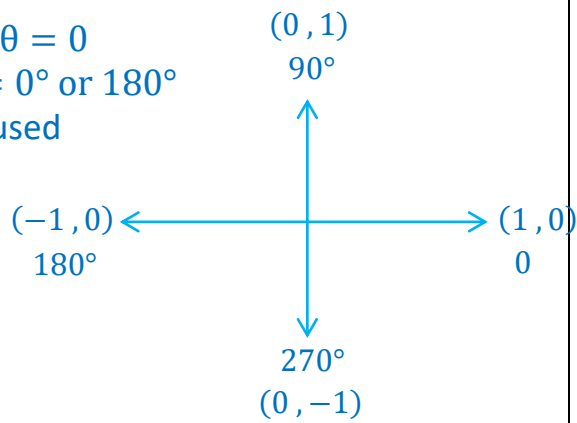


45.c

$$\sin \theta = 0$$

$$\theta = 0^\circ \text{ or } 180^\circ$$

refused



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المراجعة رقم (3)

اختبار شهر مارس



First Algebra

Choose the correct answer from the given ones :

Q

1

If $A^t + B^t = \begin{pmatrix} 3 & -1 \\ 1 & 0 \end{pmatrix}$, then $5(A + B)^t = \dots\dots\dots$

- (a) $\begin{pmatrix} 9 & -3 \\ 3 & 0 \end{pmatrix}$ (b) $\begin{pmatrix} 15 & -5 \\ 5 & 0 \end{pmatrix}$ (c) $\begin{pmatrix} -1 & 3 \\ 1 & 0 \end{pmatrix}$ (d) $\begin{pmatrix} -1 & 0 \\ 3 & 1 \end{pmatrix}$
-
-
-
-
-
-
-
-

2

If $\begin{pmatrix} 2 & x+3 & 4 \\ 1 & 5 & 7 \\ 2z & y+1 & 0 \end{pmatrix}$ is a symmetric matrix, then $x + y + z = \dots\dots\dots$

- (a) 4 (b) 6 (c) 8 (d) 10
-
-
-
-
-
-
-

3 If A is a skew symmetric matrix of order 3×3 , then $a_{11} + a_{22} + a_{33} = \dots\dots\dots$

(a) 3

(b) 2

(c) 1

(d) 0

4 If B is skew symmetric matrix, then the additive inverse of the matrix B =

(a) B

(b) $\mathbf{B}^t$

(c) – $\mathbf{B}^t$

(d) I

5

If $\begin{pmatrix} 2 & 4 \\ -3 & 5 \end{pmatrix} + \begin{pmatrix} 1 & -3 \\ 2 & 6 \end{pmatrix} = \begin{pmatrix} 3k & -y \\ 2x & 11 \end{pmatrix}$, then $x + y + k = \dots\dots\dots$

(a) -3

(b) -6

(c) 1

(d) -8

6

If $A = \begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix}$, then $A^2 - 2A = \dots\dots\dots$

(a) I

(b) O

(c) A

(d) 4A

[illegible]

If $X + \begin{pmatrix} -2 & 4 \\ 5 & 3 \end{pmatrix} = O_{2 \times 2}$, then $X = \dots\dots\dots$

(b) I

(c) $\begin{pmatrix} -2 & 4 \\ 5 & -3 \end{pmatrix}$

(d) $\begin{pmatrix} 2 & -4 \\ -5 & -3 \end{pmatrix}$

9

If the matrix $\begin{pmatrix} a & b & c \\ d & h & u \\ n & k & f \end{pmatrix}$ is skew-symmetric matrix, then $\frac{a+b+c+u}{d+n+k+f} = \dots\dots\dots$

(a) zero

(b) 1

(c) - 1

(d) 2

10

If $A = \begin{pmatrix} 2 & -3 \\ -1 & 4 \end{pmatrix}$, $B = \begin{pmatrix} 2k & -1 \\ 3m & 4 \end{pmatrix}$ where $A = B^t$, then $2k + 3m = \dots\dots\dots$

(a) 1

(b) - 1

(c) 2

(d) 3

11

If $\begin{pmatrix} 6 & 1 \\ 5 & -3 \end{pmatrix} = x \begin{pmatrix} 0 & 1 \\ 5 & 0 \end{pmatrix} + y \begin{pmatrix} -2 & 0 \\ 0 & 1 \end{pmatrix}$, then $2x + y = \dots\dots\dots$

- (a) 1** **(b) -1** **(c) 2** **(d) 6**

12

If $\begin{pmatrix} 4 & 1 \\ 3 & 1 \end{pmatrix} \begin{pmatrix} 1 & -1 \\ -3 & x \end{pmatrix} = I$, then $x = \dots\dots\dots$

- (a) 3 (b) -3 (c) zero (d) 4

13

If x , y and z are real numbers and : $x \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix} + y \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} + z \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$
, then $x y z = \dots\dots\dots$

(a) 3

(b) - 5

(c) 6

(d) - 6

14

If $A \times \begin{pmatrix} 3 & -1 \\ 2 & -1 \end{pmatrix} = I$, then $A = \dots\dots\dots$

(a) $\begin{pmatrix} 1 & -1 \\ 2 & -3 \end{pmatrix}$ (b) $\begin{pmatrix} 2 & -1 \\ 3 & -1 \end{pmatrix}$ (c) $\begin{pmatrix} -1 & 3 \\ -1 & 2 \end{pmatrix}$ (d) $\begin{pmatrix} -1 & 1 \\ -2 & 3 \end{pmatrix}$

15

If $A = \begin{pmatrix} 2 & -1 \\ 4 & -2 \end{pmatrix}$, then $A^2 = \dots\dots\dots$

(a) $\begin{pmatrix} 2 & -1 \\ 4 & -2 \end{pmatrix}$

(b) $\begin{pmatrix} 2 & 4 \\ -1 & -2 \end{pmatrix}$

(c) $O_{1 \times 1}$

(d) $O_{2 \times 2}$

16

If $\begin{pmatrix} 3^x & 2x+y \\ x+y & 3^y \end{pmatrix} = \begin{pmatrix} 25 & b \\ a & 5 \end{pmatrix}$, then $\frac{b}{a} = \dots\dots\dots$

(a) $\frac{3}{5}$

(b) $\frac{5}{3}$

(c) 15

(d) 5

17

If $A = \begin{pmatrix} 2 & 3 \end{pmatrix}$, $B = \begin{pmatrix} x & 0 \\ 1 & y \end{pmatrix}$, $A \times B = \begin{pmatrix} 9 & 6 \end{pmatrix}$, then $x + y = \dots\dots\dots$

(a) 5

(b) 7

(c) 3

(d) 9

18

If the product of the two matrices $A \times B = I$ and the matrix $A = \begin{pmatrix} 2 & 3 \\ 5 & 8 \end{pmatrix}$, then the matrix $B = \dots\dots\dots$

(a) $\begin{pmatrix} 2 & 3 \\ 5 & 8 \end{pmatrix}$ (b) $\begin{pmatrix} 8 & 5 \\ 3 & 2 \end{pmatrix}$ (c) $\begin{pmatrix} 8 & -3 \\ -5 & 2 \end{pmatrix}$ (d) $\begin{pmatrix} -2 & 5 \\ 3 & -8 \end{pmatrix}$

19

If $X = \begin{pmatrix} 2 & 4 \\ -4 & 3 \end{pmatrix}$, then $X^2 - 5X = \dots\dots\dots$

(a) I

(b) $-22I$ (c) X^t (d) $22I$

20

If the product of the two matrices $A \times B = I$ and the matrix $A = \begin{pmatrix} 2 & 3 \\ 5 & 8 \end{pmatrix}$, then the matrix $B = \dots\dots\dots$

(a) $\begin{pmatrix} 2 & 3 \\ 5 & 8 \end{pmatrix}$ (b) $\begin{pmatrix} 8 & 5 \\ 3 & 2 \end{pmatrix}$ (c) $\begin{pmatrix} 8 & -3 \\ -5 & 2 \end{pmatrix}$ (d) $\begin{pmatrix} -2 & 5 \\ 3 & -8 \end{pmatrix}$

Second Trigonometry

Choose the correct answer from the given ones :

1 $\frac{\tan \theta \cot \theta}{\sec \theta} = \dots\dots\dots$ in the simplest form.

- (a) $\sin \theta$ (b) $\cos \theta$ (c) $\sec \theta$ (d) $\csc \theta$

2 $\sin \theta \cos \theta \cot \theta + \sin^2 \theta = \dots\dots\dots$

- (a) 0 (b) 1 (c) $2 \sin^2 \theta$ (d) $2 \cos^2 \theta$

3

(a) $\sin^2 B$

(b) $\cos^2 B$

(c) $\sin B \cos B$

(d) $\csc^2 B$

4

$$5 \cos^2 30^\circ + 5 \sin^2 30^\circ = \dots\dots\dots$$

(a) 1

(b) 5

(c) 10

(d) 25

$$\frac{\sin^2 x}{\cos^2 x} + \csc x \cdot \sin x = \dots\dots\dots$$

(d) $\csc^2 x$

If $\tan^2 \theta = 15$, then $\sec^2 \theta = \dots\dots\dots$

(d) 16

9 If $0^\circ \leq \theta < 180^\circ$, $\cot \theta = 1$, then $\theta = \dots\dots\dots$

(a) 30°

(b) 45°

(c) 60°

(d) 135°

10 If $0 \leq \theta < 180^\circ$, $\cos^2 \theta + \cos \theta = 0$, then the solution set is

(a) $\{90^\circ\}$

(b) $\{90^\circ, 180^\circ\}$

(c) $\{0^\circ, 180^\circ\}$

(d) $\{0^\circ, 90^\circ\}$

11

The general solution of the equation : $\cos \theta = \frac{1}{2}$ is ($n \in \mathbb{Z}$)

(a) $\pm \frac{\pi}{3} + 2n\pi$

(b) $\pm \frac{\pi}{6} + 2n\pi$

(c) $\frac{\pi}{6} + n\pi$

(d) $\frac{\pi}{3} + n\pi$

12

If $A = \begin{pmatrix} \sin \theta & \frac{1}{2} \\ 1 & \sin \theta \end{pmatrix}$ where $0 \leq \theta \leq \frac{\pi}{2}$ if $a_{11} \times a_{22} = a_{12} \times a_{21}$, then $\theta = \dots\dots\dots$

(a) $\frac{\pi}{3}$

(b) $\frac{\pi}{6}$

(c) $\frac{\pi}{4}$

(d) $\frac{\pi}{2}$

13

The general solution of : $\sqrt{3} \tan \theta - 1 = 0$ is

(a) $\frac{\pi}{6} \pm 2n\pi$

(b) $\frac{\pi}{6} + n\pi$

(c) $\frac{\pi}{3} + n\pi$

(d) $\frac{\pi}{3} \pm 2n\pi$

14

$\frac{\sin \theta}{\csc \theta} + \frac{\cos \theta}{\sec \theta} = \dots\dots\dots$

(a) $\tan \theta$

(b) $\sin \theta + \cos \theta$

(c) $\sec \theta \csc \theta$

(d) 1

15 If $\sin \theta = 3 \cos \theta$, then $\sec^2 \theta = \dots\dots\dots$

(a) 9

(b) 10

(c) 8

(d) 4

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Third: Geometry

Choose the correct answer from the given ones :

1 If $\vec{A} = (5 , 12)$, then $\| \vec{A} \| = \dots\dots\dots$

(a) 13

(b) 14

(c) 15

(d) 16

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If $\vec{M} = (1, 5)$, $\vec{MN} = (4, 7)$, then $\|\vec{N}\| = \dots\dots\dots$

(b) 12

(c) 17

(d) 13

If $\vec{A} + \vec{B} = (8, 16)$, $\vec{A} = (5, 12)$, then $\|\vec{B}\| = \dots\dots\dots$

(a) 7

(b) 5

(c) 13

(d) $8\sqrt{5}$

If $\vec{A} = 3\hat{i} + k\hat{j}$ and $\|\vec{A}\| = 5$, then $k = \dots\dots\dots$

- [illegible]

The polar form of the vector $\vec{A} = -3 \hat{j}$ is

-
- This image shows a blank sheet of white paper with ten horizontal dashed lines spaced evenly apart, resembling notebook paper. The lines are thin and black, extending across the full width of the page. There is no handwriting or other markings on the paper.

6 The polar form of the vector $\vec{B} = -3\sqrt{2} \hat{i} + 3\sqrt{2} \hat{j}$ is

- (a) $(6, \frac{\pi}{4})$ (b) $(6, \frac{3\pi}{4})$ (c) $(6, \frac{5\pi}{4})$ (d) $(6, \frac{7\pi}{4})$

7 If $\vec{A} = (3, 45^\circ)$, then $2\vec{A} = \dots\dots\dots$

- (a) $(6, 90^\circ)$ (b) $(6, 45^\circ)$ (c) $(3, 90^\circ)$ (d) $(3, 45^\circ)$

8

The polar form of the vector $\vec{B} = (5, -5\sqrt{3})$ is

(a) $(10, 60^\circ)$ (b) $(10, 300^\circ)$ (c) $(-10, 120^\circ)$ (d) $(5, 300^\circ)$

9

If the two vectors $\vec{A} = \hat{i} + 3\hat{j}$, $\vec{B} = -10\hat{i} + k\hat{j}$ are parallel, then the value of $k = \dots\dots\dots$

(a) -30 (b) -6 (c) 6 (d) 30

10 If $\vec{A} = (-2, 3)$, $\vec{B} = (-4, m)$, $\vec{A} \perp \vec{B}$, then the value of $m = \dots\dots\dots$

- (a) 6 (b) -6 (c) $\frac{8}{3}$ (d) $-\frac{8}{3}$

11 If $\vec{AB} = (3, -4)$, $\vec{BC} = (2, 1)$, then $\vec{CA} = \dots\dots\dots$

- (a) $(1, -5)$ (b) $(5, -3)$ (c) $(-3, 5)$ (d) $(-5, 3)$

12 All the following vectors are unit vectors except

(a) (1, 0)

(b) (0.6 , 0.8)

(c) $(0, -1)$

(d) (1, 1)

13 If $\|6k\vec{A}\| = \|-18\vec{A}\|$, then $k = \dots\dots\dots$

(a) 3

(b) - 3

(c) ± 18

(d) ± 3

14 ABCD is a parallelogram in which A (3 , 4) , B (1 , 3) , C (5 , 4) , then the coordinates of the point D are

- (a) (7 , 5) (b) (4 , 7) (c) (6 , 7) (d) (4 , 4)

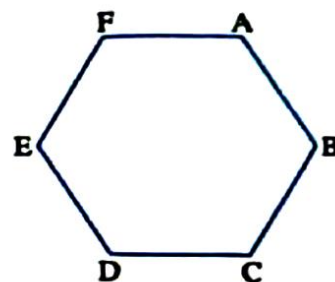
This image shows a full page of white paper with ten horizontal dashed lines, typical of primary school handwriting practice paper. The lines are evenly spaced and extend across the entire width of the page. There is no text or other markings on the paper.

15 In the opposite figure :

If ABCDEF is a regular hexagon

, then : $\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{AF} + \overrightarrow{DE} = \dots\dots\dots$

- (a) $\overrightarrow{FE}$ (b) $\overrightarrow{AE}$
(c) $\overrightarrow{AD}$ (d) $\overrightarrow{AC}$

[illegible]

16

If ABC is a triangle , then $\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{AC} = \dots\dots\dots$

- (a) $\bar{O}$

- (b) $\overline{CA}$

- (c) $2 \overline{AC}$

- (d) $2 \overline{CA}$

17

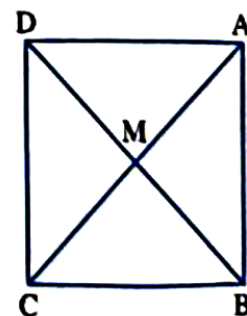
ABCD is a square whose diagonals intersect at M , then the following pairs of vectors are equivalent except

- (a) $\overrightarrow{AB}$, $\overrightarrow{DC}$

- (b) $\overrightarrow{AM}$, $\overrightarrow{MC}$

- (c) $\overrightarrow{BC}$, $\overrightarrow{AD}$

- (d) $\overrightarrow{AM}$, $\overrightarrow{MD}$



18

If ABCD is a rectangle , then $\overrightarrow{AC} + \overrightarrow{BD} = \dots\dots\dots$

(a) $2 \overrightarrow{BC}$

(b) $2 \overrightarrow{AB}$

(c) $\overrightarrow{BA}$

(d) $\overrightarrow{BC}$

19

In the opposite figure :

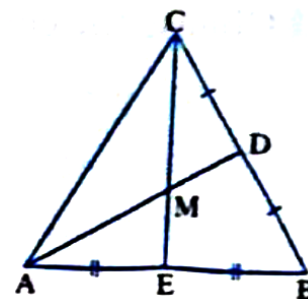
$\overrightarrow{AB} + \overrightarrow{AC} = \dots\dots\dots \overrightarrow{AM}$

(a) 2

(b) 4

(c) 3

(d) 5



22 ABCD is a parallelogram in which A (3 , 4) , B (1 , 3) , C (5 , 4) , then the coordinates of the point D are

- (a) (7 , 5) (b) (4 , 7) (c) (6 , 7) (d) (4 , 4)

[illegible]

23 If the point M is the midpoint of $\overline{XY}$, then $\overrightarrow{XM} + \overrightarrow{YM} = \dots\dots\dots$

- (a) $2 \overrightarrow{XM}$ (b) $\overrightarrow{XM}$ (c) $\vec{O}$ (d) $\overrightarrow{YX}$

This image shows a single sheet of white paper with ten evenly spaced horizontal dotted lines, typical of primary school writing paper. The lines are light gray and extend across the full width of the page. There is no handwriting or other markings on the paper.

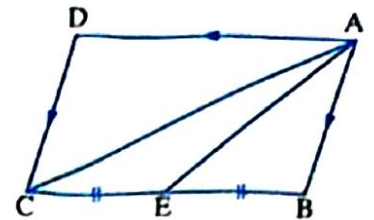
Essay Questions

1 | The general solution of the equation : $\sin\left(\frac{\pi}{2} - \theta\right) = \frac{1}{2}$ is (where $n \in \mathbb{Z}$)

ABCD is a parallelogram

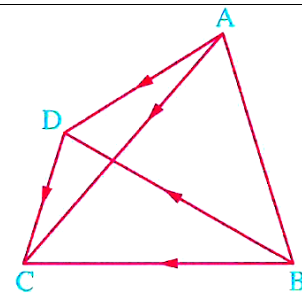
, E is the midpoint of $\overline{BC}$

Prove that : $\overrightarrow{AB} + \overrightarrow{AD} + \overrightarrow{DC} = 2 \overrightarrow{AE}$



2

In any quadrilateral ABCD , prove that : $\overrightarrow{AC} - \overrightarrow{BC} = \overrightarrow{AD} - \overrightarrow{BD}$



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Lesson (1) : Matrices

The matrix: "Is an organization of some elements written in rows and columns between brackets in the form ()".

Ex:

1 st column	2 nd	3 rd	
-5	3	10	→ 1 st row
1	4	-4	→ 2 nd row
0	$\sqrt{3}$	7	→ 3 rd row

The order of any matrix = no. of rows x no. of columns

How to express the elements in the matrix.

$A = \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \\ a_{31} & a_{32} \end{pmatrix}$

a_{32}
 ↙ ↘
 row column

∴ a_{32} is the element in 3rd row and the 2nd column.

Some types of matrices:

- A Square matrix:** It is a matrix in which the number of its rows equals the number of its columns. For example: $\begin{pmatrix} -3 & 2 \\ 4 & -1 \end{pmatrix}$ (a 2×2 square matrix)
- B Row matrix:** It is a matrix containing one row and any number of columns. For example : (2 4 6 8) (a 1×4 row matrix)
- C Column matrix:** It is a matrix containing one column and any number of rows. For example: $\begin{pmatrix} 2 \\ .5 \\ 1 \end{pmatrix}$ (a 3×1 column matrix)
- D Zero matrix:** It is a matrix in which all of its elements are Zeros. It may be a square matrix or not. For examples:
(0) is a 1×1 zero matrix, (0 0) is a 1×2 zero matrix, $\begin{pmatrix} 0 \\ 0 \end{pmatrix}$ is a 2×1 zero matrix, $\begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$ is a 2×2 square zero matrix and is denoted by $\mathbf{O}$.
- E Diagonal matrix:** It is a square matrix in which all elements are zeros except the elements of its diagonal then at least one of them is not equal to zero. For example: the matrix: $\begin{pmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 2 \end{pmatrix}$ (is a 3×3 diagonal matrix)
- F Unit matrix:** it is a diagonal matrix in which each element on the main diagonal has the numeral 1, while 0 exists in all other elements , it is denoted by I. for example: each of:

(1) , $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$, $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$ is a unit matrix.

Transpose of matrix:

If $A = (a_{xy})$ then $A^T = a_{yx}$

Where A^T is the transpose of A

Note: $(A^T)^T = A$

Ex1: Write the matrix (A_{xy}) of the dimensions 3×2 where: $a_{xy} = 2x - y$

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Ex2: Write the matrix (B_{xy}) of the order 3×3 where: $b_{xy} = 3x - 2y$

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Ex3: Find the transpose of the following matrices and write its order:

$$A = \begin{pmatrix} 2 & 3 & 0 \\ -1 & 5 & 6 \end{pmatrix}, \quad B = \begin{pmatrix} 9 \\ -2 \\ 4 \end{pmatrix} \quad \text{and} \quad C = \begin{pmatrix} -7 & 5 \\ 9 & 4 \end{pmatrix}$$

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The equality of two matrices

If A and B are two matrices then $A = B$ if and only if

- 1- A and B with the same order
- 2- The corresponding elements are equal.

$$\begin{pmatrix} 1 & 0 & -2 \\ 2 & 3 & -1 \end{pmatrix} = \begin{pmatrix} 1 & 0 & -2 \\ 2 & 3 & -1 \end{pmatrix}$$

Ex1: Find the values of x, y and Z if

$$\begin{pmatrix} 7 & 0 & 2 \\ 4 & 7 & 5 \end{pmatrix} = \begin{pmatrix} -1 & 0 & X+5 \\ 4 & 2y-3 & 5 \end{pmatrix}$$

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Ex2: If $X = \begin{pmatrix} 3a+1 & 12-b & h^3 \\ c+2d & 18 & 6 \end{pmatrix}$ $Y = \begin{pmatrix} 1 & 9 \\ 3 & 18 \\ -8 & d+2c \end{pmatrix}$

Find a , b , c , d and h if $X = Y^T$

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Symmetric and skew symmetric matrices:

If A is a square matrix , then

- A is called a symmetric matrix if and only if $A = A^T$
- A is called a skew symmetric matrix if and only if $A = -A^T$

$$A = \begin{pmatrix} 2 & -1 & -3 \\ -1 & 4 & 0 \\ -3 & 0 & 5 \end{pmatrix} \text{ is symmetric matrix} \quad B = \begin{pmatrix} 0 & 1 & -2 \\ -1 & 0 & \frac{1}{2} \\ 2 & -\frac{1}{2} & 0 \end{pmatrix} \text{ is skew}$$

symmetric

"Dot Product"

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} \times \begin{bmatrix} 7 & 8 \\ 9 & 10 \\ 11 & 12 \end{bmatrix} = \begin{bmatrix} 58 \end{bmatrix}$$

sheet (1)**Choose the correct answer from those given :**

(1) If $A = \begin{pmatrix} 1 & 1 & x-1 \\ 1 & 3 & 5 \\ -1 & 5 & 6 \end{pmatrix}$ is a symmetric matrix , then $x = \dots\dots\dots$

- (a) -1 (b) zero (c) 4 (d) 6

(2) If $A = \begin{pmatrix} 2 & -3 \\ -1 & 4 \end{pmatrix}$, $B = \begin{pmatrix} 2 & -1 \\ \frac{1}{2}k & 4 \end{pmatrix}$ where $A = B^t$, then $k = \dots\dots\dots$

- (a) -2 (b) $-\frac{3}{2}$ (c) 8 (d) -6

(3) If $A = \begin{pmatrix} 1 & 5 \\ 3 & 2 \\ -1 & 7 \end{pmatrix}$, then $a_{12} + a_{32} = \dots\dots\dots$

- (a) 8 (b) 12 (c) zero (d) 10

(4) If $\begin{pmatrix} 1 & x & 2 \\ -1 & 6 & 5 \end{pmatrix} = \begin{pmatrix} 1 & -1 \\ -3 & 6 \\ 2 & y \end{pmatrix}^t$, then $xy = \dots\dots\dots$

- (a) -15 (b) -2 (c) 2 (d) 15

Complete the following :

(1) If A is a matrix of order 2×2 and if $a_{11} = 3$, $a_{12} = 5$, $a_{21} = \frac{1}{2}$ and $a_{22} = \sqrt{5}$, then the matrix A =

(2) If A is a matrix of order 3×2 and if $a_{11} = 2$, $a_{21} = 3$, $a_{32} = \frac{1}{2} a_{11}$, $a_{22} = a_{21} + 3$, $a_{31} = -9$, $a_{12} = \frac{1}{3} a_{31}$, then the matrix A =

(3) If $Y = \begin{pmatrix} -4 & 2 & 5 \\ 1 & -\sqrt{3} & 9 \end{pmatrix}$, then the matrix Y is of order
 $y_{21} = \dots\dots\dots$, $y_{22} = \dots\dots\dots$, $\frac{1}{2} y_{12} + \sqrt{y_{23}} = \dots\dots\dots$

(4) If A is a matrix of order 2×3 , then the number of elements of the matrix A is

(5) If B is a matrix of order 3×1 , then B^t is a matrix of order

(6) If O is a zero matrix of order 3×3 , then $O^t = \dots\dots\dots$

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3] If $A = \begin{pmatrix} 5 & 2x & 8 \\ -4 & -3 & 6 \\ x+2y & 6 & 4 \end{pmatrix}$ is a symmetric matrix , then Find the value of : x , y

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4] If $B = \begin{pmatrix} 0 & 3x & 7 \\ x+3 & 0 & -2z \\ 3y-x & 6 & 0 \end{pmatrix}$ is skew symmetric matrix Find the value of x , y

and z

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Lesson (2) : Operation on matrices

I-Addition and subtraction:

To add two matrices A, B they must have the same order.

Ex1: If $A = \begin{pmatrix} 2 & 3 \\ -1 & -2 \end{pmatrix}$, $B = \begin{pmatrix} 6 & -7 \\ 4 & 3 \end{pmatrix}$

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Ex2: If $A = \begin{pmatrix} 2 & -2 \\ 4 & 6 \end{pmatrix}$, Find $3A$

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Ex3: If $A = \begin{pmatrix} 3 & 1 \\ 2 & -1 \end{pmatrix}$, $B = \begin{pmatrix} -1 & 3 \\ 4 & 6 \end{pmatrix}$, $C = \begin{pmatrix} 0 & 5 \\ -2 & 4 \end{pmatrix}$

Find: (1) $A + B$ (2) $B - C$ (3) $A + 2B - C$

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Sheet (2)**I-Complete:**

1) If $A + \begin{pmatrix} -3 & -2 \\ 5 & 4 \end{pmatrix} = 0$, then $A = \dots\dots\dots$

2) If O is the Zero matrix of order 2×2 , then $4O = \dots\dots\dots$ and it is of order.....3) If each of the matrices A and B is of order 3×1 , then the resultant matrix of $A - 2B$ is of order.....

4) $\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}^T = \dots\dots\dots$ which is of order.....

5) If $A = \begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix}$, then $3A = \dots\dots\dots$, $-2A = \dots\dots\dots$

6) If $A = \begin{pmatrix} 15 & 10 \\ 5 & 20 \end{pmatrix}$, then $A = 5 \begin{pmatrix} \dots\dots\dots & \dots\dots\dots \\ \dots\dots\dots & \dots\dots\dots \end{pmatrix}$

2] If $A = \begin{pmatrix} -3 & 1 \\ 2 & 5 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & 4 \\ -1 & 3 \end{pmatrix}$

Check that: 1) $(A + B)^T = A^T + B^T$ 2) $A - B \neq B - A$

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3] If $\begin{pmatrix} 3 & 6 \\ 5 & -7 \end{pmatrix} + \begin{pmatrix} 1 & -4 \\ -2 & 6 \end{pmatrix} = \begin{pmatrix} X & 4 \\ 7 & Y \end{pmatrix}$

Find the value of X and Y.

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4] Find X, Y, Z, and L that satisfy that:

$$X \begin{pmatrix} 1 & 3 \\ 5 & Y \end{pmatrix} + Z \begin{pmatrix} 2 & L \\ 0 & 4 \end{pmatrix} + 5 \begin{pmatrix} 1 & 1 \\ 1 & 2 \end{pmatrix} = O_{2 \times 2}$$

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7] If $A = \begin{pmatrix} 5 & -3 & 6 \\ 2 & 5 & 0 \\ 4 & -2 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 7 & 1 & 3 \\ -4 & 21 & -5 \\ 3 & 12 & 6 \end{pmatrix}$

Find the matrix X such that: $3A + X = 2B$

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8] If $X + 2X^T = \begin{pmatrix} 9 & 14 \\ 13 & 6 \end{pmatrix}$, find the matrix X.

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9] If $A = \begin{pmatrix} 2 & -1 \\ 5 & -3 \end{pmatrix}$ and $B^T = \begin{pmatrix} -1 & 0 \\ 3 & 4 \end{pmatrix}$,

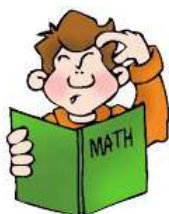
Find the matrix X such that: $4X - 3B + 2A^T = A + (5B - X)^T$.

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Lesson (3) : Multiplying Matrices

✚ If A is a matrix of order $m \times n$, B is a matrix of order $r \times L$, then their product $C = A \times B$ will be defined if and only if $n = r$

✚ To multiply two matrices A no. of columns = no. or rows B

 2×3 3×1

2x1 is the order of the product
matrix

Ex1: If $A = \begin{pmatrix} 4 & -3 \\ 2 & -1 \end{pmatrix}$, $B = \begin{pmatrix} -2 & 1 \\ 5 & 6 \end{pmatrix}$

Ex2: If $A = \begin{pmatrix} 3 & -2 \\ 0 & 2 \\ -1 & 4 \end{pmatrix}$, $B = \begin{pmatrix} 3 & -1 \\ 5 & 7 \end{pmatrix}$, $C = \begin{pmatrix} 4 & 0 & 3 \\ 5 & 2 & -1 \end{pmatrix}$

and $D = \begin{pmatrix} 1 & 2 \\ -1 & 3 \end{pmatrix}$ Check that: 1) $(AB)^T = B^T A^T$ 2) $(AB)C =$

$A(BC)$

Sheet (3)**1 Complete the following :**

- (1) If A is a matrix of order $m \times n$ and B is a matrix of order $r \times l$, then AB is defined if and AB is undefined if
- (2) If A is a matrix of order 3×1 and B is a matrix of order 1×3 , then AB is a matrix of order and BA is a matrix of order
- (3) If A is a matrix of order 2×3 and AB is defined as a matrix of order 2×1 , then B is a matrix of order
- (4) If A is a matrix of order 2×3 and B^t is a matrix of order 1×3 , then AB is a matrix of order
- (5) If A is a square matrix, I is the identity matrix of the same order of A, then $A \times I = I \times A = \dots\dots\dots$, $I^t = \dots\dots\dots$, $I^2 = \dots\dots\dots$, $I^3 = \dots\dots\dots$, $I^n = \dots\dots\dots$ where n is a positive integer.

2] If $X = \begin{pmatrix} -1 & 2 \\ 0 & 3 \end{pmatrix}$ and $Y = \begin{pmatrix} 1 & 1 \\ -1 & 1 \end{pmatrix}$, **prove that** : $XY \neq YX$.

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3] If $X = \begin{pmatrix} 2 & 1 \\ 3 & 1 \end{pmatrix}$ and $Y = \begin{pmatrix} 2 & 2 \\ 3 & 3 \end{pmatrix}$, **find** : $X^2 - Y^2$

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Lesson (4) : Determinants

second order

$$|A| = \begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - cb$$

Ex:1 Find the value of the following determinant :

a) $\begin{vmatrix} 2 & 5 \\ 3 & 8 \end{vmatrix}$

b) $\begin{vmatrix} 4 & -7 \\ 2 & 6 \end{vmatrix}$

c) $\begin{vmatrix} 5 & 4 \\ -3 & -2 \end{vmatrix}$

d) $\begin{vmatrix} \sin \theta & \cos \theta \\ -\cos \theta & \sin \theta \end{vmatrix}$

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• Third order

$$|A| = \begin{vmatrix} a & b & c \\ d & e & f \\ g & h & j \end{vmatrix} = a \begin{vmatrix} e & f \\ h & j \end{vmatrix} - b \begin{vmatrix} d & f \\ g & j \end{vmatrix} + c \begin{vmatrix} d & e \\ g & h \end{vmatrix}$$

$$= -a \begin{vmatrix} e & f \\ h & j \end{vmatrix} + b \begin{vmatrix} d & f \\ g & j \end{vmatrix} - c \begin{vmatrix} d & e \\ g & h \end{vmatrix}$$

Ex:2 Find the value of the following determinant :

a) $\begin{vmatrix} 4 & -1 & 3 \\ 0 & 5 & -2 \\ 0 & -3 & -1 \end{vmatrix}$

b) $\begin{vmatrix} -1 & 2 & 5 \\ 0 & 3 & -2 \\ 0 & 0 & 6 \end{vmatrix}$

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□ Another method

$$\begin{vmatrix} a & b & c \\ d & e & l \\ m & n & k \end{vmatrix} \xrightarrow{\text{Repeat the first two}} \begin{vmatrix} a & b & c \\ d & e & l \\ m & n & k \end{vmatrix} \begin{vmatrix} a & b \\ d & e \\ m & n \end{vmatrix}$$

$$S1 = aek + blm + cdn$$

$$S2 = bdk + aln + cem$$

Then the value of the determinant is $S = S1 - S2$

➤ Remark :

(1) The triangular matrix:

It is a square matrix in which elements above or below principal diagonal are zeroes

$$\text{Ex) } \begin{pmatrix} a & 0 \\ c & d \end{pmatrix}, \begin{pmatrix} a & b & c \\ 0 & e & l \\ 0 & 0 & k \end{pmatrix}$$

$$\text{Its determinant} = \begin{vmatrix} a_{11} & a_{12} \\ 0 & a_{22} \end{vmatrix} = a_{11} \times a_{22}$$

$$\text{And } \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ 0 & a_{22} & a_{23} \\ 0 & 0 & a_{33} \end{vmatrix} = a_{11} \times a_{22} \times a_{33}$$

(2) Finding the area of triangle using determinants:

If ΔABC in which $A(x_1, y_1), B(x_2, y_2)$ and $C(x_3, y_3)$

$$\text{Then the area of triangle } ABC = \frac{1}{2} |A| \text{ where } A = \begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}$$

Steps:

$$\text{a) Find } A = \begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}$$

$$\text{b) Area} = \frac{1}{2} |A|$$

Note: use elements of the 3rd column because it is easier

(3) To prove that three points are collinear:

The three points $(x_1, y_1), (x_2, y_2)$ and $C(x_3, y_3)$ are collinear if

$$A = \begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = \text{zero}$$

➤ Cramer's rule

First: solving a system of linear equations of two variables:

To solve the two equations $ax + by = m$ and $cx + dy = n$ follow the steps:

1) Find the three determinants $\Delta, \Delta x$ and Δy where

$$\Delta = \begin{vmatrix} a & b \\ c & d \end{vmatrix}, \Delta x = \begin{vmatrix} m & b \\ n & d \end{vmatrix}, \Delta y = \begin{vmatrix} a & m \\ c & n \end{vmatrix}, \Delta \neq 0$$

2) To find the value of x, y

$$x = \frac{\Delta x}{\Delta}, y = \frac{\Delta y}{\Delta}$$

Note: If $\Delta = 0$ then the system has no solution

Second: solving a system of linear equations of three variables:

To solve the two equations $a_1x + b_1y + c_1z = m, a_2x + b_2y + c_2z = n$ and $a_3x + b_3y + c_3z = k$ follow the steps:

1) Find the four determinants $\Delta, \Delta x, \Delta y$ and Δz where

$$\Delta = \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}, \Delta x = \begin{vmatrix} m & b_1 & c_1 \\ n & b_2 & c_2 \\ k & b_3 & c_3 \end{vmatrix}, \Delta y = \begin{vmatrix} a_1 & m & c_1 \\ a_2 & n & c_2 \\ a_3 & k & c_3 \end{vmatrix}$$

$$\Delta z = \begin{vmatrix} a_1 & b_1 & m \\ a_2 & b_2 & n \\ a_3 & b_3 & k \end{vmatrix}, \Delta \neq 0$$

2) To find the value of x, y and z

$$x = \frac{\Delta x}{\Delta}, y = \frac{\Delta y}{\Delta}, z = \frac{\Delta z}{\Delta}$$

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Ex:3 solve the equation :
$$\begin{vmatrix} x & 0 & 1 \\ 8 & 1-x & -x \\ x & -1 & 1+x \end{vmatrix} = 0$$

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Ex:4 Find the area of a triangle whose vertices are

X(1,2) ,Y(3,-4) and Z(-2,3)

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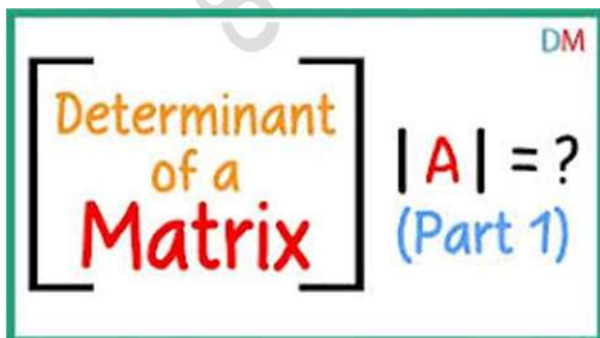
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Sheet 4**1 Find the value of each of the following determinants :**

$$(1) \begin{vmatrix} 7 & 5 \\ 3 & 2 \end{vmatrix}$$

$$(2) \begin{vmatrix} 1 & 2 \\ 3 & -1 \end{vmatrix}$$

$$(3) \begin{vmatrix} -2 & -2 \\ 4 & 0 \end{vmatrix}$$

2 Prove that :

$$(1) \begin{vmatrix} 2x & -1 \\ 2 & 3x \end{vmatrix} + \begin{vmatrix} 3 & 6x \\ x & 1 \end{vmatrix} = \begin{vmatrix} 3 & 13 \\ -2 & -7 \end{vmatrix}$$

$$(2) \begin{vmatrix} \csc \theta & \cot^2 \theta \\ 1 & \csc \theta \end{vmatrix} \times \begin{vmatrix} 2 & -3 \\ 5 & -7 \end{vmatrix} = 1$$

3 Find the value of each of the following determinants

$$(1) \begin{vmatrix} 1 & 2 & 3 \\ -1 & 4 & 4 \\ 0 & 7 & 8 \end{vmatrix}$$

$$(2) \begin{vmatrix} 0 & 42 & 3 \\ 2 & 18 & 7 \\ 0 & 28 & 3 \end{vmatrix}$$

4 Solve each of the following equations

(1) $\begin{vmatrix} 2 & 1 \\ 4 & x \end{vmatrix} = 0$

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(2) $\begin{vmatrix} x & -1 \\ 2 & x \end{vmatrix} + \begin{vmatrix} 1 & 3 \\ 2 & x \end{vmatrix} = 2$

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(3) $\begin{vmatrix} 0 & -1 & x \\ x & 4 & 3 \\ 2 & 1 & 2 \end{vmatrix} = 10$

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Find using determinants the area of the triangle :

(1) A (2 , 4) , B (-2 , 4) , C (0 , -2)

(2) X (3 , 3) , Y (-4 , 2) , Z (1 , -4)

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Use determinants to prove that each of the following points are collinear :

(1)  (3 , 5) , (4 , -1) , (5 , -7)

(2) (3 , 2) , (-1 , 0) , (-5 , -2)

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 Solve each of the following systems of linear equations by Cramer's rule :

(1) $2x - 3y = 5$, $3x + 4y = -1$

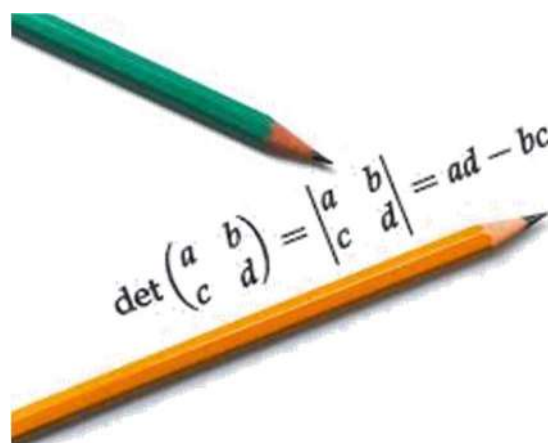
(2) $x + 3y = 5$, $2x + 5y = 8$

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Solve each of the following systems of linear equations by Cramer's rule :

(1)  $2x + y - 2z = 10$, $3x + 2y + 2z = 1$, $5x + 4y + 3z = 4$

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Lesson (1)**Trigonometric identities****➤ Trigonometric identity:**

It is an inequality which is true for all values of the variable

Ex) $\tan \theta = \frac{\sin \theta}{\cos \theta}$ is called identity because it is true for all values of θ

➤ Inequality: it is not true for all values of the variable

Ex) $\sin \theta = \frac{1}{2}$

Basic trigonometric identities

$$(1) \tan \theta = \frac{\sin \theta}{\cos \theta}$$

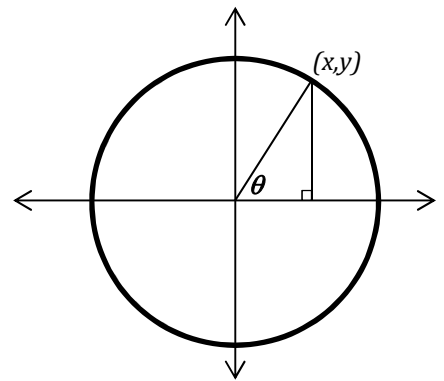
$$(2) \cot \theta = \frac{\cos \theta}{\sin \theta}$$

$$(3) \sin \theta = \frac{1}{\csc \theta}, \csc \theta = \frac{1}{\sin \theta} \text{ and } \cos \theta = \frac{1}{\sec \theta}, \sec \theta = \frac{1}{\cos \theta}$$

$$(4) \tan \theta = \frac{1}{\cot \theta}, \cot \theta = \frac{1}{\tan \theta}$$

(5) From the unit circle:

$$x^2 + y^2 = 1 \text{ then } \boxed{\sin^2 \theta + \cos^2 \theta = 1}$$



Dividing by $\cos^2 \theta$

$$\frac{\sin^2 \theta}{\cos^2 \theta} + \frac{\cos^2 \theta}{\cos^2 \theta} = \frac{1}{\cos^2 \theta} \text{ then } \tan^2 \theta + 1 = \sec^2 \theta$$

$$\boxed{\sec^2 \theta = 1 + \tan^2 \theta}$$

Dividing by $\sin^2 \theta$

$$\boxed{\csc^2 \theta = 1 + \cot^2 \theta}$$

Sheet (1)

1 Which of the following relations represents an equation and which of them represents an identity :

(1) $\cos\left(\frac{\pi}{2} - \theta\right) = \sin \theta$

(2) $\cot \theta = \frac{-1}{\sqrt{3}}$

(3) $\tan\left(\frac{3\pi}{2} + \theta\right) = -\cot \theta$

(4) $\cos\left(\frac{3\pi}{2} - \theta\right) = -\sin \theta$

(5) $\sin^2 \theta + \cos^2 \theta = 1$

(6) $\sin(2\pi - \theta) = -\frac{1}{2}$

2 Choose the correct answer from the given ones :

(1) $\cos(90^\circ - \theta) \sec(\theta - 90^\circ)$ in the simplest form equals

(a) 1

(b) -1

(c) $\sin^2 \theta$

(d) $\cot^2 \theta$

(2) The expression : $\frac{1 - \cos^2 \beta}{\sin^2 \beta - 1}$ in the simplest form equals

(a) $-\tan^2 \beta$

(b) $-\cos^2 \beta$

(c) $\tan^2 \beta$

(d) $\cot^2 \beta$

(3) $\frac{1 + \tan^2 \theta}{1 + \cot^2 \theta}$ in the simplest form equals

(a) $\tan^2 \theta$

(b) $\cot^2 \theta$

(c) 1

(d) $\cos^2 \theta$

(4) $\sin^2 \theta + \cos^2 \theta + \tan^2 \theta = \dots\dots\dots$

(a) 1

(b) $\cot^2 \theta$

(c) $\csc^2 \theta$

(d) $\sec^2 \theta$

(5) $(\tan^2 \theta - \sec^2 \theta)^5 = \dots\dots\dots$

(a) 1

(b) -1

(c) 5

(d) -5

(6) $2 \sin^2 \theta + \cos^2 \theta + \frac{1}{\sec^2 \theta} = \dots\dots\dots$

(a) 2

(b) 1

(c) $\tan^2 \theta$

(d) $\sec^2 \theta$

(7) $\sin \theta \csc \theta + 2 \cos \theta \sec \theta + 3 \tan \theta \cot \theta = \dots\dots\dots$

(a) 1

(b) 3

(c) 5

(d) 6

(8) In ΔABC , if $\sin^2 A + \cos^2 B = 1$, then ΔABC is

(a) equilateral.

(b) isosceles.

(c) scalene.

(d) right-angled.

3 Complete the following “where θ is the measure of an angle in which all trigonometric functions and their reciprocals are defined at it” :

(1) $\sin \theta \csc \theta = \dots\dots\dots$

(2) $\cos \theta = \frac{1}{\dots\dots\dots}$

(3) $\cot \theta \tan \theta = \dots\dots\dots$

(4) $\frac{\sin \theta}{\cos \theta} = \dots\dots\dots$

(5) $\sin^2 \theta + \cos^2 \theta = \dots\dots\dots$

(6) $\sin^2 \theta = 1 - \dots\dots\dots$

(7) $\tan^2 \theta + 1 = \dots\dots\dots$

(8) $\cot^2 \theta + 1 = \dots\dots\dots$

4 Write in the simplest form each of the following expressions “where θ is the measure of an angle in which all trigonometric functions and their reciprocals are defined at it” :

1 $(\sin \theta + \cos \theta)^2 - 2 \sin \theta \cos \theta$

2 $\sin \left(\frac{\pi}{2} + \theta \right) \sec (-\theta)$

3 $\cos^2 \theta \sec \theta \csc \theta$

4 $\sin \theta \csc \theta - \cos^2 \theta$

.....

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5 Prove the validity of each of the following identities :

1 $\sin (90^\circ - \mu) \cos \mu = 1 - \sin^2 \mu$

2 $\cot^2 \mu - \cos^2 \mu = \cot^2 \mu \cos \mu^2$

3 $\sec^2 \beta + \csc^2 \beta = \sec^2 \beta \csc^2 \beta$

4 $\sec \theta - \sin \theta \tan \theta = \cos \theta$

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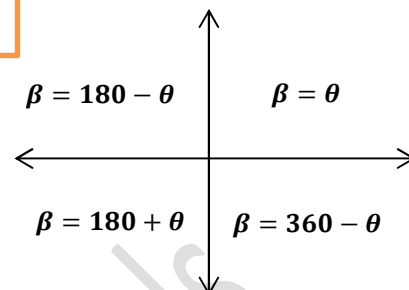
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Lesson (2)Solving trigonometric equations**First: finding the general solution****Steps:**

- Determine the quadrant
- Find the angle " shift"
- Add $2n\pi$



- The general solution the equation : $\cos \theta = a$ is $\theta = \pm \beta + 2\pi n$
- The general solution the equation : $\sin \theta = a$ is
 $\theta = \beta + 2\pi n$, $\theta = (\pi - \beta) + 2\pi n$
- The general solution the equation : $\tan \theta = a$ is $\theta = \beta + \pi n$

Sheet (2)**1 Complete the following :**

- The general solution of the equation : $\sin \theta = 1$ for all values of θ is
- The general solution of the equation : $\cos \theta = 1$ for all values of θ is
- The general solution of the equation : $\sin \theta = -1$ for all values of θ is
- The general solution of the equation : $\cos \theta = -1$ for all values of θ is
- The general solution of the equation : $\sin \theta = 0$ for all values of θ is
- The general solution of the equation : $\cos \theta = 0$ for all values of θ is
- The general solution of the equation : $\tan \theta = 1$ for all values of θ is
-  The general solution of the equation : $\sin \theta = \cos \theta$ for all values of θ is
- The solution set of the equation : $\sin \theta = \frac{1}{2}$, where $\theta \in]0, \frac{\pi}{2}[$ is

2 Choose the correct answer :

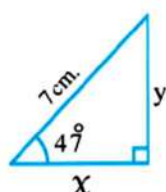
- (1) If $0^\circ \leq \theta < 360^\circ$ and $\sin \theta + 1 = 0$, then $\theta = \dots\dots\dots$
 (a) 0° (b) 90° (c) 180° (d) 270°
- (2) If $0^\circ \leq \theta < 360^\circ$ and $\cos \theta + 1 = 0$, then $\theta = \dots\dots\dots$
 (a) 90° (b) 180° (c) 270° (d) 360°
- (3) If $0^\circ \leq \theta < 360^\circ$ and $\csc \theta - 1 = 0$, then $\theta = \dots\dots\dots$
 (a) 0° (b) 90° (c) 180° (d) 270°
- (4) The solution set of the equation : $\sqrt{3} \tan \theta = 1$, where $90^\circ < \theta < 270^\circ$ is $\dots\dots\dots$
 (a) $\{30^\circ\}$ (b) $\{150^\circ\}$ (c) $\{210^\circ\}$ (d) $\{240^\circ\}$
- (5) The solution set of the equation : $\sin \theta + \cos \theta = 0$, where $180^\circ < \theta < 360^\circ$ is $\dots\dots\dots$
 (a) $\{210^\circ\}$ (b) $\{225^\circ\}$ (c) $\{240^\circ\}$ (d) $\{315^\circ\}$
- (6) If $\theta \in [0, \pi]$, $\cot \theta = 1$, then $\theta = \dots\dots\dots$
 (a) 30° (b) 45° (c) 60° (d) 135°
- (7) If $\theta \in [0, \frac{\pi}{2}]$, $\sin \theta \cot \theta = \frac{1}{2}$, then the solution set is $\dots\dots\dots$
 (a) $\emptyset$ (b) $\{\frac{\pi}{3}\}$ (c) $\{\frac{4\pi}{3}\}$ (d) $\{\frac{5\pi}{3}\}$
- (8) The solution set of the equation : $\sin^2 \theta + 1 = 0$, $\theta \in [0, \pi]$, is $\dots\dots\dots$
 (a) $\{90^\circ\}$ (b) $\{0^\circ\}$ (c) $\{180^\circ\}$ (d) $\emptyset$
- (9) If $180^\circ \leq \theta < 360^\circ$ and $2 \cos \theta + 1 = 0$, then $\theta = \dots\dots\dots$
 (a) 210° (b) 240° (c) 300° (d) 330°
- (10) The general solution of the equation : $\tan \theta = \frac{1}{\sqrt{3}}$ is $\dots\dots\dots$ (where $n \in \mathbb{Z}$)
 (a) $\frac{\pi}{6} + n\pi$ (b) $2n\pi \pm \frac{\pi}{6}$ (c) $\frac{\pi}{3} + n\pi$ (d) $2n\pi \pm \frac{\pi}{3}$
- (11) The general solution of the equation : $\cos \theta = \frac{1}{2}$ is $\dots\dots\dots$ (where $n \in \mathbb{Z}$)
 (a) $2n\pi \pm \frac{\pi}{3}$ (b) $2n\pi \pm \frac{\pi}{6}$ (c) $\frac{\pi}{6} + n\pi$ (d) $\frac{\pi}{3} + n\pi$

Lesson (3)

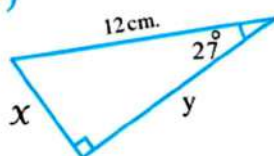
Solving the right-angled triangle

1 Find the value of each of x and y in each of the following figures :

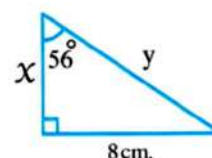
(1)



(2)

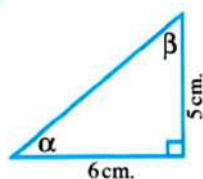


(3)

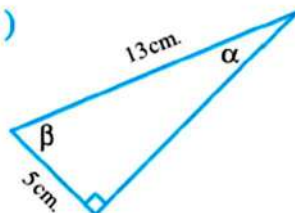


2 Find the value of each of the angles α and β in degree measure in each of the following figures :

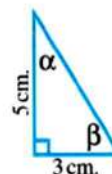
(1)



(2)



(3)



3 ABC is a right-angled triangle at B. Find AB to one decimal , if :

(1) $m(\angle C) = 32^\circ 18'$ and $AC = 25$ cm.

Sheet (3)

1 ABC is a right-angled triangle at B. Find AB to one decimal , if :

1 $m(\angle C) = 54^\circ 13'$ and $BC = 20$ cm.

« 27.7 cm. »

.....

.....

.....

2 ABC is a right-angled triangle at B. Find $m(\angle C)$ to the nearest minute , if :

1 $BC = 54$ cm. and $AC = 88$ cm.

« $52^\circ 9'$ »

.....

.....

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3 Solve the triangle ABC which is right-angled at B approximating the measures of angles to the nearest degree and the lengths of sides to the nearest cm. where :

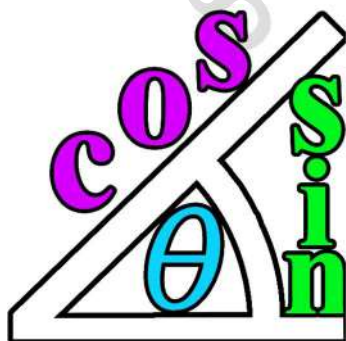
(1) $AB = 4$ cm , $BC = 6$ cm.

(2) $AB = 12.5$ cm , $BC = 17.6$ cm.

.....

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Lesson (1)

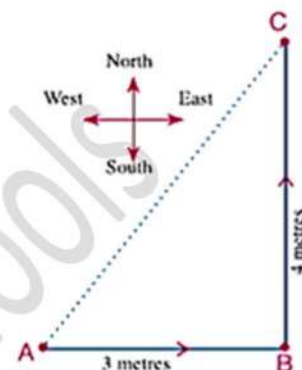
Scalars, Vectors & Directed line segment

Scalar quantities

Scalar quantities are determined completely by their magnitude only such as length, area ...

Vector quantities

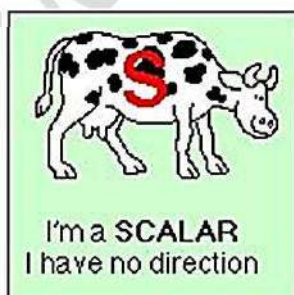
- Vector quantities are determined completely by their magnitude and
- their direction such as velocity, force. ...



Notice that:

- **Distance** is a scalar quantity which is the result of $AB + BC$ or $CB + BA$.
- **Displacement** is the distance between the starting and ending points only and in direction from A to C. i.e to describe the displacement, its magnitude AC and its direction from A to C must be determined.

Displacement is a vector quantity which is the distance covered in a certain direction.

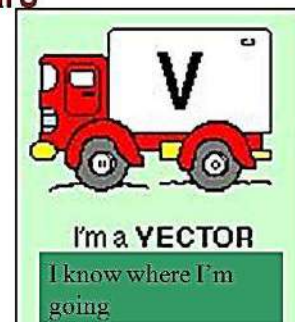
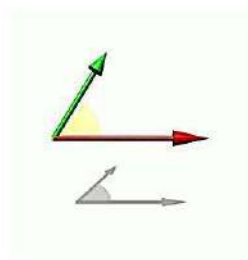


Vector Addition

$$R = A + B$$

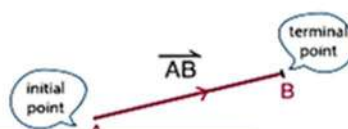
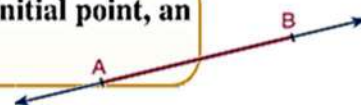


Vectors and Scalars





Definition 1 The directed line segment: is a line segment which has an initial point, an terminal point and a direction.



Definition 2 The norm of the directed line segment: norm of $\overrightarrow{AB}$ is the length of $\overline{AB}$ and is denoted by the symbol $\|\overrightarrow{AB}\|$.

Notice that: $\|\overrightarrow{AB}\| = \|\overrightarrow{BA}\| = AB$

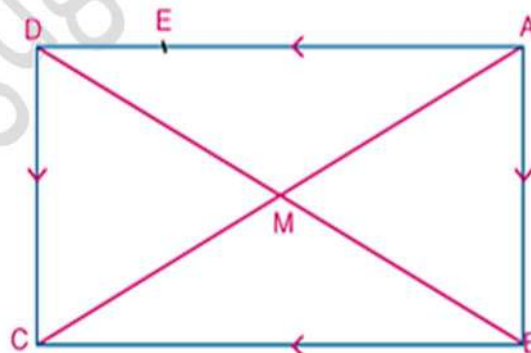


Definition 3 Equivalent directed line segments: Two directed line segments are said to be equivalent if they have the same norm and same direction.

Example

- 1 In the figure opposite: ABCD is a rectangle, its diagonals are intersecting at M. $E \in \overline{AD}$ then:

$\overline{AB} \parallel \overline{CD}$, $AB = CD$, $\overline{BC} \parallel \overline{AD}$, $BC = AD$ and
 $MA = MC = MB = MD$



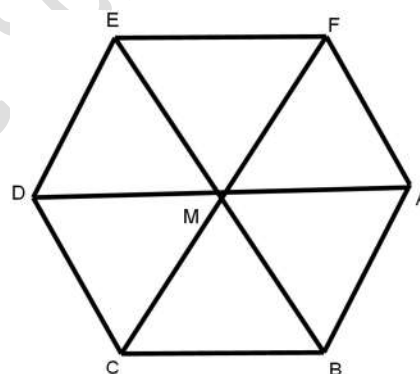
- A $\because \|\overrightarrow{AB}\| = \|\overrightarrow{DC}\|$, $\overrightarrow{AB}$ and $\overrightarrow{DC}$ have the same direction
 $\therefore \overrightarrow{AB}$ is equivalent to $\overrightarrow{DC}$
- B $\because \|\overrightarrow{AM}\| = \|\overrightarrow{MC}\|$, $\overrightarrow{AM}$ and $\overrightarrow{MC}$ have the same direction
 $\therefore \overrightarrow{AM}$ is equivalent to $\overrightarrow{MC}$
- C $\because \|\overrightarrow{MA}\| = \|\overrightarrow{MB}\|$, $\overrightarrow{MA}$ and $\overrightarrow{MB}$ have different direction
 $\therefore \overrightarrow{MA}$ is not equivalent to $\overrightarrow{MB}$
- D $\because \|\overrightarrow{AE}\| \neq \|\overrightarrow{CB}\|$, $\overrightarrow{AE}$ and $\overrightarrow{CB}$ have the same direction
 $\therefore \overrightarrow{AE}$ is not equivalent to $\overrightarrow{CB}$

Sheet (1)**1 Complete :**

- 1 to define scalar quantity you should know
- 2 to define vector quantity you should know
- 3 the directed line segment is a line segment which has,,
- 4 two directed line segment are equivalent if they have
- 5 in the opposite figure :

ABCDEF is a regular hexagon , then

- a) $\overrightarrow{AB}$ is equivalent to And equivalent to
- b) $\overrightarrow{MD}$ is equivalent to And equivalent to
- c) $\overrightarrow{MD}$ is equivalent to And equivalent to

**2 On the lattice** , if : A(3,-2) , B(6,2) , C(1,3) , D(4,7)

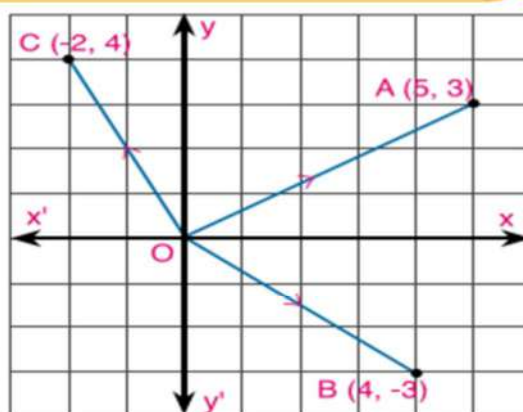
- a) Find : $\|\overrightarrow{AB}\|$ and $\|\overrightarrow{CD}\|$
- b) prove that : $\overrightarrow{AB}$ equivalent to $\overrightarrow{CD}$

Lesson (2)**Vectors****Position Vector**

Definition The position vector of a given point with respect to the origin point is the directed line segment which its starting point is the origin point and the given point is its terminal point.

A (5, 3), B(4, -3), C (-2, 4) then:

- $\vec{OA}$ is the position vector of the point A with respect to the origin point O, and corresponding to the ordered pair (5, 3) and is written as $\vec{OA} = (5, 3)$.

**Norm of the vector:**

Is the length of the line segment representing to the vector.

If: $\vec{R} = (x, y)$

Then: $\|\vec{R}\| = \sqrt{x^2 + y^2}$

Polar form of position Vector

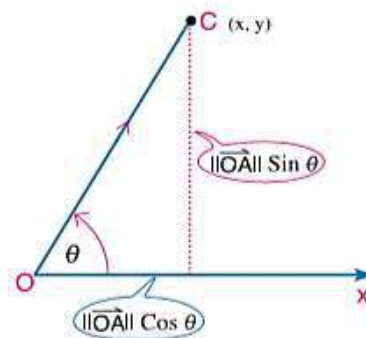
In the figure opposite: the vector $\vec{OA}$ makes θ with the positive direction of the x-axis and its norm equals $\|\vec{OA}\|$. It is possible to express it as follows:

$$\vec{OA} = (\|\vec{OA}\|, \theta)$$

Polar form of the vector.

the coordinates of point A in the orthogonal coordinate plane are:

$$x = \|\vec{OA}\| \cos \theta, \quad y = \|\vec{OA}\| \sin \theta, \quad \tan \theta = \frac{y}{x}$$



The unit vector : it is a vector whose norm is unity.

Zero vector : it is a vector whose norm equals zero and denoted by $\vec{0} = (0,0)$

Parallel and perpendicular vector

For every non zero vectors $\vec{A} = (x_1, y_1)$ and $\vec{B} = (x_2, y_2)$

1) if $\vec{A} \parallel \vec{B}$

Then $\tan \theta_1 = \tan \theta_2$

And $\frac{y_1}{x_1} = \frac{y_2}{x_2}$

And $x_1 y_2 - x_2 y_1 = 0$

2) if $\vec{A} \perp \vec{B}$

Then $\tan \theta_1 \times \tan \theta_2 = -1$

And $\frac{y_1}{x_1} \times \frac{y_2}{x_2} = -1$

And $x_1 x_2 + y_1 y_2 = 0$

Example

If $\vec{A} = (6, -8)$, $\vec{B} = (-9, 12)$ and $\vec{C} = (-4, -3)$

(1) Prove that : $\vec{A} \parallel \vec{B}$, $\vec{B} \perp \vec{C}$, $\vec{C} \perp \vec{A}$

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Example

If $\vec{M} = (3, 2)$ and $\vec{N} = (2, k)$, **find the value of k in each of the two cases :**

(1) $\vec{M} \parallel \vec{N}$

(2) $\vec{M} \perp \vec{N}$

.....
.....
.....



Sheet (2)**1 Complete the following :**

- (1) The position vector of a given point is
- (2) The fundamental unit vector $\hat{i}$ is the directed line segment to the origin point and its norm is and its direction is
- (3) If $\vec{A} = (4, 5)$ and $\vec{B} = (3, -2)$, then $2\vec{A} + \vec{B} = \dots\dots\dots$
- (4) If $\vec{A} = 2\hat{i} + 3\hat{j}$ and $\vec{B} = 3\hat{i} - \hat{j}$, then $2\vec{A} - \vec{B} = \dots\dots\dots$
- (5) If $\vec{E} = \vec{O}$ and $\vec{E} = (2 - a, b + 3)$, then $a = \dots\dots\dots$, $b = \dots\dots\dots$
- (6) If $\vec{A} = (5, -12)$, then $\|\vec{A}\| = \dots\dots\dots$

Choose the correct answer from the given ones :

- (1) If $\vec{A} + \vec{B} = (8, 16)$ and $\vec{A} = (5, 12)$, then $\|\vec{B}\| = \dots\dots\dots$
- (a) 7 (b) 5 (c) 13 (d) $8\sqrt{5}$
- (2) All the following vectors are unit vectors except
- (a) (1, 0) (b) (0.6, 0.8) (c) (0, -1) (d) (1, 1)
- (3) If $\|k(3, 4)\| = 1$, then $k = \dots\dots\dots$
- (a) $\frac{1}{7}$ (b) $\frac{1}{25}$ (c) $\pm\frac{1}{5}$ (d) ± 5
- (4) The vector $\vec{M} = (8\sqrt{2}, \frac{\pi}{4})$ is expressed in terms of the fundamental unit vectors by the form
- (a) $4\hat{i} + 4\hat{j}$ (b) $8\hat{i} - 8\hat{j}$ (c) $-4\hat{i} - 8\hat{j}$ (d) $8\hat{i} + 8\hat{j}$
- (5) If $\vec{A} = (4, 5)$ and $\vec{B} = (-20, 16)$, then the two vectors $\vec{A}$ and $\vec{B}$ are
- (a) perpendicular. (b) parallel. (c) equivalent. (d) otherwise.
- (6) If $\vec{L} = (2, -3)$ and $\vec{K} = (3, 1 - x)$ are parallel, then $x = \dots\dots\dots$
- (a) 4 (b) $\frac{11}{2}$ (c) -1 (d) -9
- (7) If $\vec{A} = (x, 4)$, $\vec{B} = (2, y)$ and $\vec{A} \parallel \vec{B}$, then
- (a) $x + 2y = 0$ (b) $x = 2y$ (c) $xy = 8$ (d) $\frac{-}{y} \cdot 2$

If $\vec{A} = (6, -8)$, $\vec{B} = (-9, 12)$ and $\vec{C} = (-4, -3)$

(1) Prove that : $\vec{A} \parallel \vec{B}$, $\vec{B} \perp \vec{C}$, $\vec{C} \perp \vec{A}$

(2) Find : $2\vec{A} + \vec{B}$, $\vec{B} - 2\vec{C}$, $\frac{1}{2}\vec{A} + \vec{B} - 3\vec{C}$

.....
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.....

If $\vec{M} = (3, 2)$ and $\vec{N} = (2, k)$, **find the value of k in each of the two cases :**

(1) $\vec{M} \parallel \vec{N}$

(2) $\vec{M} \perp \vec{N}$

.....
.....
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If $\| -8\vec{A} \| = 5 \| k\vec{A} \|$, **find the value of : k**

.....
.....

Find the polar form of each of the following vectors :

(1) $\vec{M} = 8\sqrt{3}\vec{i} + 8\vec{j}$

(2) $\vec{N} = 3\sqrt{2}\vec{i} + 3\sqrt{2}\vec{j}$

(3) $\vec{OA} = (5, 5\sqrt{3})$

(4) $\vec{B} = (7\sqrt{3}, -7)$

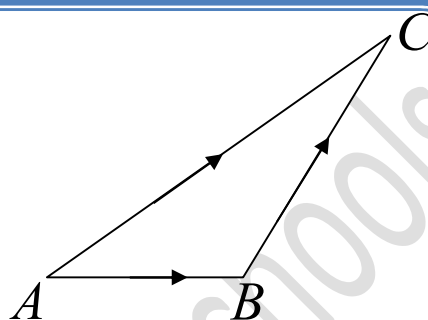
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Lesson (3)**Operation On Vectors****First**

Adding vectors geometrically

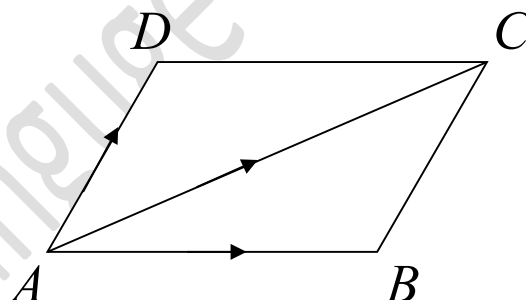
1] the triangle rule :

$$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$$



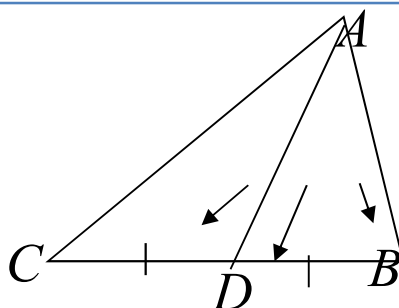
2] the parallelogram rule :

$$\overrightarrow{AB} + \overrightarrow{AD} = \overrightarrow{AC}$$



3] the median rule:

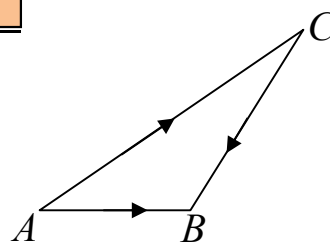
$$\overrightarrow{AB} + \overrightarrow{AC} = 2\overrightarrow{AD}$$

**Second**

Subtracting two vectors geometrically

$$\overrightarrow{AB} - \overrightarrow{AC} = \overrightarrow{CB}$$

$$\overrightarrow{AB} = \overrightarrow{B} - \overrightarrow{A}$$



Example**In the quadrilateral ABCD , prove that :**

$$(1) \overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CD} = \overrightarrow{AD} \quad | \quad (2) \overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{DC} + \overrightarrow{AD}$$

.....

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Sheet (3)**1 Complete :**

1 if: $\vec{A} = (-1, 5)$, $\vec{B} = (2, 1)$, then $\|\vec{AB}\| = \dots\dots$

2 if: $\vec{A} = (4, -2)$, $\vec{AB} = (3, 5)$, then $\vec{B} = \dots\dots$

3 if: M is a midpoint of $\overline{XY}$, then $\vec{XM} + \vec{YM} = \dots\dots$

4 if: ABC is a triangle, then $\vec{AB} + \vec{BC} + \vec{CA} = \dots\dots$

5 if: ABC is a triangle, then $\vec{AB} - \vec{CB} = \dots\dots$, $\vec{BA} - \vec{BC} = \dots\dots$

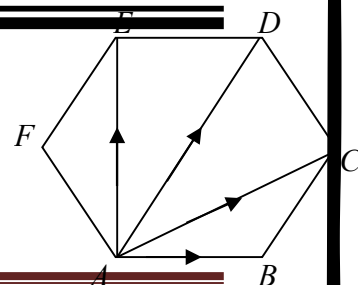
2 ABCD is a trapezium in which in which $\vec{AD} \parallel \vec{BC}$, E is the midpoint of $\vec{AB}$ F is the midpoint of $\vec{DC}$.prove that : $\vec{AD} + \vec{BC} = 2 \vec{EF}$ **3** ABCD is a quadrilateral in which : $\vec{BC} = 3 \vec{AD}$.prove that :

a) ABCD is a trapezium

b) $\vec{AC} + \vec{BD} = 4 \vec{EF}$

4 ABCDEF is regular hexagon prove that :

$$\vec{AB} + \vec{AC} + \vec{AE} + \vec{AF} = 2 \vec{AD}$$



Lesson (4)**Application on Vectors****First** Geometric applications

We know that if $\overrightarrow{AB} = k \overrightarrow{DC}$, $k \neq 0$, then $\overrightarrow{AB}$ and $\overrightarrow{DC}$ are :

- carried by the same straight line

I.e. : A , B , C , D are collinear.

or

- carried by two parallel straight lines

I.e. : $\overrightarrow{AB} \parallel \overrightarrow{DC}$

Remark

If ABCD is a quadrilateral in which $\overrightarrow{AB} = k \overrightarrow{DC}$, $k \neq 0$, then

$\overrightarrow{AB} \parallel \overrightarrow{DC}$, $\|\overrightarrow{AB}\| = |k| \|\overrightarrow{DC}\|$ and vice versa.

Example

Use vectors to prove that : the points A (1, 4), B(-1, -2), C(2, -3) are vertices of right angled triangle at B.

.....

Example

Use the vectors to prove that: the points A (3, 4), B(1, -1), C(-4, -3), D(2, 2) are vertices of a rhombus.

.....

Second Physical applications**1 The resultant force**

- **The force :** is a vector passes through a given point and acts along a straight line.
- **The force :** is represented by a directed line segment and it is drawn by a suitable drawing scale.

For example :

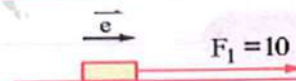
- 1** A force of magnitude $F_1 = 10$ Newton acts in the East direction.

$$\vec{F}_1 = 10 \vec{e}$$

$\vec{F}_1$ is represented by a directed line segment of length 2 cm.

Remember that :

- 1** Consider $\vec{e}$ a unit vector in the East direction.
- 2** Choose a suitable drawing scale "Each 5 Newton is represented on drawing by 1 cm".

**Example**

If the forces: $\vec{F}_1 = 2\vec{i} + \vec{j}$, $\vec{F}_2 = \vec{i} + 7\vec{j}$, $\vec{F}_3 = \vec{i} - 5\vec{j}$ act on a particle, Calculate the magnitude and direction of their resultant (forces are measured in Newton).

.....
.....

$$\vec{V}_{BA} = \vec{V}_B - \vec{V}_A$$

Relative Velocity**Example**

A car (A) moves on a straight road with speed 70 km/h, A car (B) moves on the same road with speed 90 km/h. Find the relative velocity of car (A) with respect to car (B) when:

- The two cars move in the same direction.
- The two cars move in the opposite direction.

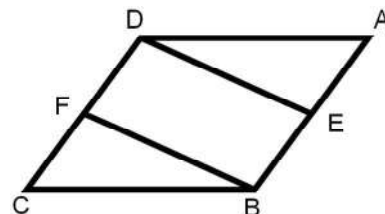
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Sheet (4)**First****Geometry**

1 ABCD is a parallelogram ,E is a midpoint of AB

F is a midpoint of DC

Prove that : DEBF is a parallelogram

2 ABCD is a quadrilateral , if $\overrightarrow{AC} + \overrightarrow{BD} = 2 \overrightarrow{DC}$ prove that :

ABCD is a parallelogram

3 using vectors prove that : A(3,4) , B(1,-1) , C(-4,-3) , D(-2,2)

are vertices of a rhombus

4 using vectors prove that : A(1,3) , B(6, 1) , C(4,-4) , D(-1,-2)

are vertices of a square and find its area.

5 ABCD is a trapezium , AD//BC

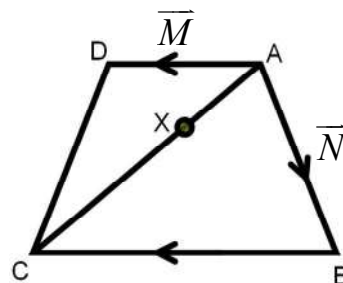
$$AD = \frac{1}{2} BC, \overrightarrow{AB} = \vec{N}, \overrightarrow{AD} = \vec{M}$$

a) Express in term of $\vec{M}$ and $\vec{N}$ each of the following :

$$\overrightarrow{BC}, \overrightarrow{AC}, \overrightarrow{DC}, \overrightarrow{DB}$$

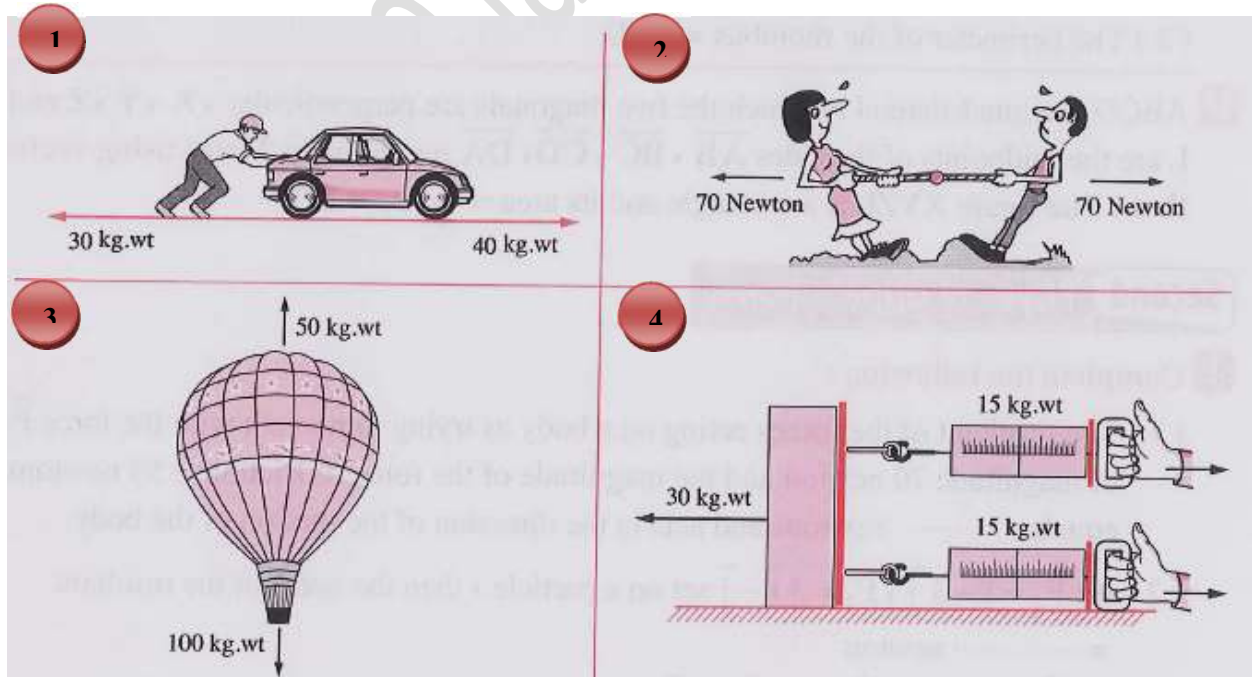
b)if : $X \in \overline{AC}$ where $AX = \frac{1}{3} \times AC$

prove that : the point D , X and B are collinear .



Second Physical application**1** Complete:

- 1 If: $\vec{F}_1 = i - 3j$, $\vec{F}_2 = 3i - j$ act on a particle, then the norm of the resultant =N
- 2 If: $\vec{F}_1 = (a, b)$, $\vec{F}_2 = -3i + 4j$ act on a particle and the system is in equilibrium, then $a = \dots\dots$, $b = \dots\dots$
- 3 If: $\vec{V}_A = 12\vec{e}$, $\vec{V}_B = 8\vec{e}$, then $\vec{V}_{AB} = \dots\dots$
- 4 If: $\vec{V}_A = 120\vec{e}$, $\vec{V}_B = -80\vec{e}$, then $\vec{V}_{BA} = \dots\dots$, $\vec{V}_{AB} = \dots\dots$
- 5 If: $\vec{V}_{AB} = 75\vec{e}$, $\vec{V}_A = -60\vec{e}$, then $\vec{V}_{BA} = \dots\dots$, $\vec{V}_B = \dots\dots$

2 Find the resultant force $\vec{F}$ acting in each of the following:

3 In each of the following, the two forces $\vec{F}_1$ and $\vec{F}_2$ act at a particle. Show the magnitude and the direction of the resultant of each two forces:

- 1 $F_1 = 15$ newtons acts in the east direction,
 $F_2 = 40$ newtons acts in the west direction.
- 2 $F_1 = 34$ gm.wt. acts in the north east direction,
 $F_2 = 34$ gm.wt. acts in the south west direction.
- 3 $F_1 = 50$ dyne acts in 60° west of the north direction,
 $F_2 = 50$ dyne acts in 30° south of the east direction.
- 4 $F_1 = 30$ newtons acts in 20° east of the north direction ,
 $F_2 = 30$ newtons acts in 70° north of the east direction.

4 Forces $\vec{F}_1 = 7\mathbf{i} - 5\mathbf{j}$, $\vec{F}_2 = a\mathbf{i} + 3\mathbf{j}$, $\vec{F}_3 = -4\mathbf{i} + (b-3)\mathbf{j}$, find the values of a and b if:

- (1) The system of forces are in equilibrium.
- (2) The resultant of the forces = $-5\mathbf{j}$



كيفية طباعة صفحات معينة من ملف معين مثلا ازاي نطبع الصفحات من صفحة 4 الى صفحة 9

